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GRADUATE CATALOG

University Record 1994/1995

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This publication has been adopted as a rule of the University pursuant to the provisions of Chapter 120 of the Florida Statute. Addenda to the University Record Series, if any, are available upon request to the Office of the Registrar.

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GRADUATE CATALOG

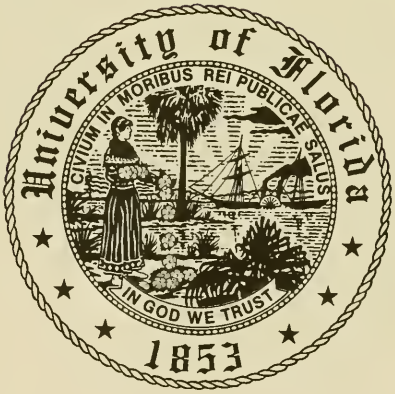

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Photo by Murray Laurie

TABLE OF CONTENTS

OFFICERS OF ADMINISTRATION iv

CRITICAL DATES FOR GRADUATE STUDENTS vi

UNIVERSITY CALENDAR vi

GENERAL INFORMATION 1

THE UNIVERSITY OF FLORIDA 3
Institutional Purpose 3
Mission and Goals 3

THE GRADUATE SCHOOL 5

GRADUATE DEGREES AND PROGRAMS 5
Nonthesis Degrees 5
Thesis Degrees 6

ADMISSION TO THE GRADUATE SCHOOL 8

GENERAL REGULATIONS 10

REQUIREMENTS FOR MASTER'S DEGREES 12

REQUIREMENTS FOR ENGINEER DEGREE 20

REQUIREMENTS FOR ED.S. AND ED.D. 21

REQUIREMENTS FOR PH.D. 22

RESIDENCY 25

EXPENSES 27

HOUSING 29

FINANCIAL AID 31

SPECIAL FACILITIES AND PROGRAMS 35
Research and Teaching Facilties 35
Interdisciplinary Graduate Studies 39
Research Organizations 44
Interdisciplinary Research Centers 46

STUDENT SERVICES 51

FIELDS OF INSTRUCTION 53
COLLEGES AND AREAS OF INSTRUCTION, INDEXED BY COLLEGE 54
FIELDS OF INSTRUCTION, ALPHABETICALLY LISTED 56

GRADUATE FACULTY 178

INDEX 220

SUMMARY OF PROCEDURES FOR MASTER'S, ENGINEER, AND SPECIALIST IN EDUCATION DEGREES 224

SUMMARY OF PROCEDURES FOR DOCTORAL DEGREES 225

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CRITICAL DATES FOR GRADUATE STUDENTS

DEADLINE DATES FOR GRADUATE STUDENTS

FALL SEMESTER 1994

University Dates

Admission Application	June 10
Registration	August 17-19
Classes Begin	August 22
Degree Application	September 16
Midpoint of Semester	October 19
Classes End	December 9
Commencement	December 17

Thesis and Dissertation

First Submission of Dissertation	October 17
Submit Signed Original Thesis and Final Exam Form	November 14
Submit Signed Dissertation and Final Exam Form	December 12

GSFLT Date

GSFLT Examination	October 15

SPRING SEMESTER 1995

University Dates

Admission Application	November 1
Registration	January 6
Classes Begin	January 9
Degree Application	February 3
Midpoint of Semester	March 13
Classes End	April 28
Commencement	May 6

Thesis and Dissertation

First Submission of Dissertation	March 13
Submit Signed Original Thesis and Final Exam Form	April 3
Submit Signed Dissertation and Final Exam Form	May 1

GSFLT Date

GSFLT Examination	February 4

SUMMER TERM A

University Dates

Admission Application	March 1
Registration	May 12
Classes Begin	May 15
Degree Application C	May 17
Classes End	June 23

SUMMER TERM B

University Dates

Admission Application	April 14
Registration	June 30
Classes Begin	July 3
Degree Application B	July 6
Midpoint of Summer Terms	July 3
Classes End	August 11
Commencement (B & C)	August 12

Thesis and Dissertation

First Submission of Dissertation (A, B & C)	July 3
Submit Signed Original Thesis and Final Exam Form (A, B & C)	July 19
Submit Signed Dissertation and Final Exam Form (A, B & C)	August 7

GSFLT Date

GSFLT Examination	June 10

UNIVERSITY OF FLORIDA CALENDAR

FALL SEMESTER

1994

January 10, Monday, 4:00 p.m.

Deadline for receipt of application and completion of all application procedures, including departmental requirements, and receipt of official transcripts, for graduate program in Department of Clinical and Health Psychology.

February 15, Tuesday, 4:00 p.m.

Deadline for receipt of application and completion of all application procedures, including departmental requirements, and receipt of official transcripts for graduate programs in architecture and counseling psychology.

March 16, Wednesday, 4:00 p.m.

Deadline for receipt of application and completion of all application procedures, including departmental requirements, and receipt of official transcripts for graduate programs in anthropology and nursing.

April 1, Friday, 4:00 p.m.

Deadline for receipt of application and completion of all application procedures, including departmental requirements, and receipt of official transcripts for Master of Business Administration program.

June 10, Friday, 4:00 p.m.

Deadline for receipt of application and completion of all application procedures, including departmental requirements, and receipt of official transcripts for all graduate programs except those listed with an earlier deadline date.

July 1, Friday, 4:00 p.m.

Last day for receipt of application and completion of application procedures, including departmental requirements, and receipt of official transcripts for Master of Laws in Taxation program.

August 5, Friday, 4:00 p.m.

Last day to request transfer of credit for fall candidates for degrees.

August 17-19, Wednesday–Friday

Registration according to appointments.

August 22, Monday

Drop/Add begins.

Late registration begins. Students subject to late registration fee of at least $50 and no more than $100.

Classes begin.

August 24, Wednesday, 4:00 p.m.

Last day to drop a course or to change sections without fee liability.

Last day student may withdraw from the University and receive full refund of fees.

August 25, Thursday, 4:00 p.m.

Last day to complete late registration and to add a course (no drops).

August 26, Friday, 4:00 p.m.

Last day to file address change, if not living in residence halls, to receive all University correspondence.

September 2, Friday, 3:30 p.m.

Fee payments are due in full. All waivers must be established. Students who have not paid fees or arranged to pay fees with University Financial Services will be subject to a late payment fee of at least $50 and no more than $100.

Deadline for receipt of request for residency reclassification, and all appropriate documents.

September 5, Monday, Labor Day

All classes suspended.

September 16, Friday, 4:00 p.m.

Last day student may withdraw from the University and receive 25% refund of course fees.

Last day to apply at Office of the University Registrar for degree to be conferred at end of Fall Semester.

October 15, Saturday, 9:00 a.m.

Foreign language reading knowledge examinations (GSFLT) in French, German, and Spanish.

October 17, Monday, 4:00 p.m.

Last day for candidates for doctoral degrees to file dissertation, fee receipts for library hardbinding and microfilming, and all doctoral forms with the Graduate School, 168 Grinter Hall.

October 19, Wednesday, 4:00 p.m.

Midpoint of term for completing doctoral qualifying examination.

October 21-22, Friday-Saturday*

Homecoming. All classes suspended Friday. *This date subject to change.

November 11, Friday, Veterans Day

All classes suspended.

November 14, Monday, 4:00 p.m.

Last day to submit signed master's theses, Final Examination Reports, and binding fee receipts to Graduate School, 168 Grinter Hall.

November 23, Wednesday, 4:00 p.m.

Last day to withdraw from the University without receiving failing grades in all courses.

Last day to drop a course by college petition without receiving WF grade.

November 24-25, Thursday-Friday, Thanksgiving

All classes suspended 10:00 p.m., November 23.

December 9, Friday

All classes end.

December 10-16, Saturday-Friday

Final examinations.

December 12, Monday, 4:00 p.m.

Last day to submit signed original bond dissertations, abstracts, and Final Examination Reports to Editorial Office, 168 Grinter Hall.

Last day to submit signed original bond theses and abstracts to Editorial Office, 168 Grinter Hall.

Last day to submit Final Examination Reports for nonthesis degrees to 288 Grinter Hall.

December 15, Thursday, 9:00 a.m.

Grades for degree candidates due in Registrar's Office.

December 16, Friday, 10:00 a.m.

Reports of colleges on candidates for degrees due in Graduate School (288 Grinter Hall).

December 17, Saturday

Commencement Convocation.

December 19, Monday, 9:00 a.m.

All grades for Fall Semester due in Office of the University Registrar.

SPRING SEMESTER

1994

November 1, Tuesday, 4:00 p.m.

Deadline for receipt of application and completion of all application procedures, including departmental requirements, and receipt of official transcripts for all graduate programs, except those that accept applications only for Fall Semester.

December 9, Friday, 4:00 p.m.

Last day to request transfer of credit for spring candidates for degrees.

1995

January 6, Friday

Registration according to appointments .

January 9, Monday

Drop/Add begins.

Late registration begins. Students subject to late registration fee of at least $50 and no more than $100.

Classes begin.

January 11, Wednesday, 4:00 p.m.

Last day to drop a course or to change sections without fee liability.

Last day students may withdraw from the University and receive refund of fees.

January 12, Thursday, 4:00 p.m.

Last day to complete late registration and to add a course (no drops).

January 13, Friday, 4:00 p.m.

Last day to file address change, if not living in residence halls, to receive all University correspondence.

January 16, Monday, Martin Luther King, Jr., Day

All classes suspended.

January 20, Friday, 3:30 p.m.

Fee payments are due in full. All waivers must be established. Students who have not paid fees or arranged to pay fees with University Financial Services will be subject to a late payment fee of at least $50 and no more than $100.

Deadline for receipt of residency reclassification, and all appropriate documentation.

February 3, Friday, 4:00 p.m.

Last day to apply to Office of the University Registrar for degree to be conferred at end of Spring Semester.

Last day student may withdraw from the University and receive 25% refund of course fees.

February 4, Saturday, 9:00 a.m.

Foreign language reading knowledge examinations (GSFLT) in French, German, and Spanish.

March 6-10, Monday-Friday, Spring Break

All classes suspended.

March 13, Monday, 4:00 p.m.

Last day for candidates for doctoral degrees to file dissertations, fee receipts for library hardbinding and microfilming, and all doctoral forms with the Graduate School, 168 Grinter Hall.

Midpoint of term for completing doctoral qualifying examinations.

April 3, Monday, 4:00 p.m.

Last day to submit signed master's theses, Final Examination Reports, and binding fee receipts to Graduate School, 168 Grinter Hall.

April 14, Friday, 4:00 p.m.

Last day to withdraw from the University without receiving failing grades in all courses.

Last day to drop a course by college petition, without receiving WF grades.

April 28, Friday

All classes end.

April 29-May 6, Saturday-Saturday

Final examinations.

May 1, Monday, 4:00 p.m.

Last day to submit signed original bond dissertations, abstracts, and Final Examination Reports to Editorial Office, 168 Grinter Hall.

Last day to submit original bond theses and abstracts to Editorial Office, 168 Grinter Hall.

Last day to submit Final Examination Reports for nonthesis degrees to 288 Grinter Hall.

May 4, Thursday, 9:00 a.m.

Grades for degree candidates due in Office of the University Registrar.

May 5, Friday, 10:00 a.m.

Reports of colleges on candidates for degrees due in Graduate School (288 Grinter Hall).

May 6, Saturday

Commencement Convocation.

May 8, Monday, 9:00 a.m.

All grades for Spring Semester due in Registrar's Office.

SUMMER TERMS A, B, AND C

1995

March 1, Wednesday, 4:00 p.m.

Deadline for receipt of application and completion of all application procedures, including departmental requirements, and receipt of official transcripts for all graduate programs, except those that accept applications only for Fall Semester.

April 28, Friday, 4:00 p.m.

Last day to request transfer of credit for summer candidates for degrees.

May 12, Friday

Registration according to appointments.

May 15, Monday

Drop/Add begins.

Late registration begins. Students subject to late registration fee of at least $50 and no more than $100.

Classes begin.

May 16, Tuesday, 4:00 p.m.

Last day to complete late registration for Summer Terms A and C.

Last day to drop or add a course or to change sections without fee liability.

Last day student may withdraw from the University and receive full refund of fees.

May 17, Wednesday, 4:00 p.m.

Last day to file address change, if not living in residence halls, to receive all University correspondence.

Last day to apply at Office of the University Registrar for degree to be conferred at end of Term C.

May 24, Wednesday, 4:00 p.m.

Last day student may withdraw from the University and receive 25% refund of course fees.

May 26, Friday, 3:30 p.m.

Fee payments are due in full. All waivers must be established. Students who have not paid fees or arranged to pay fees with University Financial Services by this date will be subject to a late payment fee of at least $50 and no more than $100 .

May 29, Monday, Memorial Day

All classes suspended.

June 10, Saturday, 9:00 a.m.

Foreign language reading knowledge examinations (GSFLT) in French, German, and Spanish.

June 16, Friday, 4:00 p.m.

Last day to withdraw from the University without receiving failing grades in all courses.

Last day to drop a course by college petition without receiving WF grades.

June 23, Friday

All classes end.

Final examinations will be held in regular class periods.

June 26, Monday, 9:00 a.m.

All grades for Term A due in Registrar's Office.

TERM B

1995

April 14, Friday, 4:00 p.m.

Deadline for receipt of application and completion of all application procedures, including departmental requirements, and receipt of official transcripts for all graduate programs, except those that accept applications only for Fall Semester.

June 30, Friday

Registration according to appointments.

July 3, Monday

Drop/Add begins. Late registration begins. Students subject to a late registration fee of at least $50 and no more than $100.

Classes begin.

Midpoint of summer terms for completing doctoral qualifying examinations.

July 3, Monday, 4:00 p.m.

Last day for candidates for doctoral degrees to file dissertations, fee receipts for library hardbinding and microfilming, and all doctoral forms with the Graduate School, 168 Grinter Hall.

July 4, Tuesday, Independence Day.

All classes suspended.

July 5, Wednesday, 4:00 p.m.

Last day to complete late registration for Term B.

Last day to drop or add a course or to change sections without fee liability.

Last day student may withdraw from the University and receive full refund of fees.

July 6, Thursday, 4:00 p.m.

Last day to file address change, if not living in residence halls, to receive all University correspondence.

Last day to apply at Office of the University Registrar for degree to be conferred at end of Term B.

July 14, Friday, 3:30 p.m.

Fee payments are due in full. All waivers must be established. Students who have not paid fees or arranged to pay fees with University Financial Services by this date will be subject to a late payment fee of at least $50 and no more than $100.

July 12, Wednesday, 4:00 p.m.

Last day student may withdraw from the University and receive 25% refund of course fees.

Deadline for receipt of residency request and all appropriate documentation.

July 19, Wednesday, 4:00 p.m.

Last day to submit signed master's theses, Final Examination Reports, and binding fee receipts to Graduate School, 168 Grinter Hall.

August 4, Friday, 4:00 p.m.

Last day to withdraw from the University without receiving failing grades in all courses.

Last day to drop a course by college petition without receiving WF grades.

August 7, Monday, 4:00 p.m.

Last day to submit signed original bond dissertations, abstracts, and Final Examination Reports to Editorial Office, 168 Grinter Hall.

Last day to submit original bond theses and abstracts to Editorial Office, 168 Grinter Hall.

Last day to submit Final Examination Reports for nonthesis degrees to 288 Grinter Hall.

August 10, Thursday, 9:00 a.m.

Grades for degree candidates due in Registrar's Office.

August 11, Friday

All classes end.

Final examinations will be held in regular class periods.

August 11, Friday, 10:00 a.m.

Reports of colleges on degree candidates due in Graduate School (288 Grinter Hall).

August 12, Saturday

Commencement Convocation.

August 14, Monday, 9:00 a.m.

All grades for Terms B and C due in Registrar's Office.

NOTE: For some departments, deadlines for receipt of admission applications may be earlier than those stated in the current University Calendar.

Photo by Murray Laurie

General Information

Rules, policies, fees, and courses described in
this Catalog are subject to change without notice.

THE UNIVERSITY OF FLORIDA

INSTITUTIONAL PURPOSE

The University of Florida is a public, land-grant research university, one of the most comprehensive in the United States; it encompasses virtually all academic and professional disciplines. It is the oldest and largest of Florida's nine universities and a member of the American Association of Universities. Its faculty and staff are dedicated to the common pursuit of the University's threefold mission: education, research, and service.

Teaching—undergraduate and graduate through the doctorate—is the fundamental purpose of the University. Research and scholarship are integral to the education process and to expanding humankind's understanding of the natural world, the mind, and the senses. Service is the University's obligation to share the benefits of its knowledge for the public good.

These three interlocking elements span all of the University of Florida's academic disciplines and multidisciplinary centers and represent the University's obligation to lead and serve the needs of the nation, all of Florida's citizens, as well as the public and private educational system of Florida, by pursuing and disseminating new knowledge while building upon the past.

The University of Florida is committed to providing the knowledge, benefits, and services it produces with quality and effectiveness. It aspires to further national and international recognition for its initiatives and achievement in promoting human values and improving the quality of life.

MISSION AND GOALS

The University of Florida belongs to an ancient tradition of great universities. We participate in an elaborate conversation among scholars and students that extends over space and time linking the experiences of Western Europe with the traditions and histories of all cultures, that explores the limits of the physical and biological universes, and that nurtures and prepares generations of educated people to address the problems of our societies. While this university recognizes no limits on its intellectual boundaries, and our faculty and students remain free to teach and learn, to explore wherever the mind and imagination lead, we live in a real world whose constraints limit what we can do. Out of the conflict between our universal intellectual aspirations and the limitations of our environment comes the definition of the University's goals.

TEACHING

American colleges and universities share the fundamental educational mission of teaching students. The undergraduate experience, based in the arts and sciences, remains at the core of higher education in America. The formation of educated people, the transformation of mind through learning, and the launching of a lifetime of intellectual growth: these goals remain central to every university. This undergraduate foundation of American higher education has grown more complex as the knowledge we teach has grown more complex. Where once we had a single track through the arts and sciences leading to a degree, we now have multiple tracks leading to many degrees in arts and sciences a well as in a variety of professional schools. Yet even with many degrees, American university undergraduate education still rests on the fundamental knowledge of the liberal arts and sciences.

In our academic world we recognize two rather imprecisely defined categories of higher education: colleges and universities. The traditional American college specializes in a carefully crafted four-year undergraduate program, generally focused almost entirely on the arts and sciences. Universities extend the range of this undergraduate education to include advanced or graduate study leading to the Ph.D. Most American universities also include a variety of undergraduate and graduate professional programs, master's degree programs, and the like. The University of Florida shares these traditions. As an American university, we have a major commitment to undergraduate education as the foundation of our academic organization and we pursue graduate education for the Ph.D. as well as many other advanced degrees in professional fields.

We are, in addition, a major public, comprehensive, land-grant, research university. Each of these adjectives defines one of our characteristics, and through frequent repetition, this description takes on the style of a ritual incantation: rhythmic, reverent, and infrequently examined. What, then, does each of these key words mean?

MAJOR

Here, at the head of the list, we find one of our most important aspirations. We will be, we must be, and we are a major university. We define ourselves in comparison to the best universities we can find. We need not be the absolutely unambiguously best, but we must be among the best universities in the world. Exact ranking of the best universities is a meaningless exercise, but most of us can name 60 great universities. By whatever indicator of quality we choose, our university should fall into this group. If we define a group of universities who share our adjectives (major, public, comprehensive, land grant, research), then we fall into a group of perhaps the best 15 in this country. This definition of major need not be very precise. What matters is not the precision of the measuring scale but the inclusion of our university in the group.

PUBLIC

We exist thanks to the commitment and investment of the people of the State of Florida. Generations of tax dollars have constructed the facilities we enjoy and have paid the major portion of our operating budget. The graduates of this instituion, educated with tax dollars, provide the majority of our private funding. Our state legislators created the conditions that permit our faculty to educate our students, pursue their research, conduct their clinical practice, and serve their statewide constituencies. We exist, then, within the public sector, responsible and responsive to the needs of the citizens of our state. The obligations we assume as a public university determine many of our characteristics.

We have many more undergraduates than graduates; we respond quickly to the needs of the state's economy; we accommodate complex linkages with other state universities, community colleges, and K-12 public and private institutions; and we operate in cooperative symbiosis with our state's media. We also experience an often too-close interaction with the political process. Private universities that have a different profile, do not respond in the same ways to these issues. We, as a public university, must maintain a close, continuous, and effective communication with our many publics.

COMPREHENSIVE

This adjective recognizes the universal reach of our pursuit of knowledge. As a matter of principle, we exclude no field from our purview. We believe that our approach to knowledge and learning, to understanding and wisdom, requires us to be ready to examine any field, cultivate any discipline, and explore any topic that offers insight or intellectual tools. Resource limits, human or financial, may constrain us from cultivating one or another academic subspecialty, but we accept, in principle, no limit on our field of view. Even when we struggle with budget problems and must reduce a program or miss an intellectual opportunity, we do so only to meet the practical constraints of our current environment. We never relinquish the commitment to the holistic pursuit of knowledge.

LAND-GRANT

Florida belongs to the set of American universities whose mandate includes a commitment to the development and transmission of practical knowledge. As one of the land-grant universities identified by the Morrill Act of 1862, Florida has a special focus on agriculture and engineering and a mandate to deliver the practical benefits of university knowledge to every county in the state. In our university, the Institute of Food and Agricultural Sciences and the College of Engineering respond to this definition most obviously; but over time, the entire University has to come to recognize its commitment to translating the benefit of abstract and theoretical knowledge into the marketplace to sustain the economic growth that supports us all.

This commitment permeates the institutional culture and defines us as one of some 72 such institutions in America. The land-grant university is, of course, a peculiarly American invention and captures one of the powerful cultural beliefs of our country: that knowledge passes the test of utility by remaining vitally connected to industry and commerce.

RESEARCH

Research defines this university. Our faculty dedicate themselves not only to the bedrock function of education, not only to the land-grant function of service, but equally to the essential activity of research.

By research we mean the effort to expand our understanding of the natural world, the world of the mind, and the world of the senses. We define research to include the theoretical abstractions of the mathematician, the experimental discoveries of the geneticist, the insights of the semiotician, the re-creations of the historian, or the analysis of the anthropologist. We define research to capture the business professor's analysis of economic organization, the architect's design, and the musician's interpretation or the artist's special vision. Research by agronomists improves crops, and research by engineers enhances materials. Medical and clinical research cures and prevents disease. The list of research fields continues as endlessly as the intellectual concerns of our faculty and the academic vision of our colleges.

We must publish university research, whatever the field. The musician who never performs, the scientist whose work never appears for review by colleagues, the historian whose note cards never become a book may have accomplished much, but their accomplishments remain incomplete. When we say research, we mean research and creative activity that contribute to the international public conversation about the advancement of knowledge.

THE GRADUATE SCHOOL

ORGANIZATION AND HISTORY

The Graduate School consists of the dean, associate dean, the Graduate Council, and the graduate faculty. General policies and standards of the Graduate School are established by the graduate faculty. Any policy change must be approved by the graduate deans and the Graduate Council. The Graduate School is responsible for the enforcement of minimum general standards of graduate work in the University and for the coordination of the graduate programs of the various colleges and divisions of the University. The responsibility for the detailed operations of graduate programs is vested in the individual colleges, schools, divisions, and departments. In most of the colleges an assistant dean or other administrator is directly responsible for graduate study in that college.

The Graduate Council assists the dean in being the agent of the graduate faculty for execution of policy related to graduate study and associated research. The Council, which is chaired by the graduate dean, considers petitions and policy changes. Members of the graduate faculty are appointed by the dean with the approval of the Graduate Council. There are two levels of graduate faculty: Graduate Studies Faculty (GSF), who are on permanent appointments to teach graduate-level courses and direct master's theses, and Doctoral Research Faculty (DRF), who are appointed in addition to direct doctoral dissertations.

No faculty member may perform any of these functions without having been appointed to the graduate faculty, though temporary exceptions may be made in unusual circumstances.

In the beginning the organization of graduate study was very informal. Control was in the hands of a faculty committee which reported directly to the President. In 1910, however, James N. Anderson, Head of the Department of Ancient Languages, was appointed Dean of the College of Arts and Sciences and Director of Graduate Work, and in 1930 he became the first Dean of the Graduate School. He was succeeded upon his retirement in 1938 by T. M. Simpson, Head of the Department of Mathematics, who held the position until 1951. C. F. Byers, Head of the Department of Biological Sciences in the University College, served as Acting Dean from June 1951 until August 1952 when he was succeeded by L. E. Grinter. Dr. Grinter, who came from the Illinois Institute of Technology where he had been Vice President, Dean of the Graduate School, and Research Professor, served as Dean from August 1952 to 1969 when he became Acting Vice President and Dean Emeritus. Harold P. Hanson, former Chair of the Department of Physics at the University of Texas, served as Dean from 1969 to 1971 when he became Vice President for Academic Affairs. From 1971 to March 1973, Alex G. Smith, Professor of Astronomy and Physics, served as Acting Dean.

Harry H. Sisler served as Dean from March 1973 to September 1979. He was also Director of Sponsored Research. Before becoming Dean, Dr. Sisler served the University as Chair of the Department of Chemistry, Dean of the College of Arts and Sciences, and Executive Vice President. F. Michael Wahl, Associate Dean of the Graduate School, Associate Director of Sponsored Research, and Professor of Geology, served as Acting Dean from September 1979 to June 1980.

Francis G. Stehli was Dean for Graduate Studies and Research from June 1980 to September 1982. Dr. Stehli came to the University of Florida from Case Western Reserve University where he had served as Samuel St. John Professor of Geology, Chair of the Department of Geology, and Dean of Science and Engineering. Donald R. Price, Associate Dean for Research and Professor of Agricultural Engineering and later Vice President for Research, was Acting Dean from January 1983 to January 1985. Madelyn M. Lockhart, former Associate Dean of the Graduate School and Professor of Economics, served as Dean of the Graduate School from January 1985 to July 1993. She held a dual appointment as Dean of International Studies and Programs from June 1985 through August 1991. Gene W. Hemp served as Acting Dean in addition to his duties as Vice Provost and Senior Associate Vice President for Academic Affairs from July 1 to September 1, 1993.

On September 1, 1993, Karen A. Holbrook became Vice President for Research and Dean of the Graduate School. She is also Professor of Anatomy and Cell Biology and Professor of Medicine. Prior to coming to the University of Florida, Dr. Holbrook served the University of Washington's School of Medicine as Associate Dean for Scientific Affairs and Professor of Biological Structure and Medicine (Dermatology).

Graduate study at the University of Florida existed while the University was still on its Lake City campus. However, the first graduate degrees, two Master of Arts with a major in English, were awarded on the Gainesville campus in 1906. The first Master of Science was awarded in 1908, with a major in entomology. The first programs leading to the Ph.D. were initiated in 1930, and the first degrees were awarded in 1934, one with a major in chemistry and the other with a major in pharmacy. The first Ed.D. was awarded in 1948. Graduate study has had a phenomenal growth at the University of Florida. In 1930, 33 degrees were awarded in 12 fields. In 1940, 66 degrees were awarded in 16 fields. In 1992-93, the total number of graduate degrees awarded was 2,013 in more than 100 fields. The proportion of Ph.D. degrees, after the initial rapid growth, remained relatively static during most of the 1980s but during the last few years has shown a significant increase. In 1987-88, the total was 304; in 1988-89, 331 were awarded; in 1989-90, there were 345; in 1990-91, there were 358; in 1991-92, there were 360; and in 1992-93, there were 385.

GRADUATE DEGREES AND PROGRAMS

Refer to the section of this *Catalog* entitled *Fields of Instruction* for specializations in the approved programs.

NONTHESIS DEGREES

(Asterisk (*) indicates thesis option)

Master of Accounting (M.Acc.)

Master of Agriculture (M.Ag.) with program in one of the following:

Agricultural and Extension Education
Agronomy
Animal Science
Botany
Dairy Science

- Entomology and Nematology
- Food Science and Human Nutrition
- Horticultural Science: *Environmental Horticulture*
- *Horticultural Sciences*
- Microbiology and Cell Science
- Plant Pathology
- Poultry Science
- Soil and Water Science

Master of Agricultural Management and Resource Development (M.A.M.R.D.) with program in Food and Resource Economics.

Master of Arts in Teaching (M.A.T.) with program in one of the following:

- Anthropology
- French
- Geography
- Latin
- Latin American Studies
- Linguistics
- Mathematics
- Philosophy
- Political Science
- Political Science—International Relations
- Psychology
- Spanish

Master of Building Construction (M.B.C.)

Master of Business Administration (M.B.A.) with a major in business administration and a concentration in one of the following:

- *Computer and Information Sciences*
- *Decision and Information Sciences*
- *Economics*
- *Finance*
- *Health and Hospital Administration*
- *Insurance*
- *Management*
- *Marketing*
- *Real Estate and Urban Analysis*

Master of Civil Engineering (M.C.E.)*

Master of Education (M.Ed.) with program in one of the following:

- Agency Correctional and Developmental Counseling
- Curriculum and Instruction
- Early Childhood Education
- Education of the Emotionally Disturbed
- Education of the Mentally Retarded
- Educational Leadership
- Educational Psychology
- Elementary Education
- English Education
- Foreign Language Education
- Foundations of Education
- Mathematics Education
- Reading Education
- Research and Evaluation Methodology
- School Counseling and Guidance
- School Psychology
- Science Education
- Social Studies Education
- Special Education
- Specific Learning Disabilities
- Speech Pathology
- Student Personnel in Higher Education
- Vocational, Technical, and Adult Education

Master of Engineering (M.E.) with program in one of the following:

- Aerospace Engineering*
- Agricultural Engineering*
- Chemical Engineering*
- Civil Engineering*
- Coastal and Oceanographic Engineering*
- Computer and Information Sciences*
- Computer Engineering*
- Electrical Engineering*
- Engineering Mechanics*
- Engineering Science*
- Environmental Engineering Sciences*
- Materials Science and Engineering*
- Mechanical Engineering*
- Nuclear Engineering Sciences*

Master of Exercise and Sport Sciences (M.E.S.S.)

Master of Forest Resources and Conservation (M.F.R.C.)

Master of Health Science (M.H.S.) with program in one of the following:

- Health and Hospital Administration (available only with MBA)
- Occupational Therapy
- Physical Therapy
- Rehabilitation Counseling

Master of Health Science Education (M.H.S.E.)

Master of Laws in Taxation (LL.M. in Tax.)

Master of Nursing (M.Nsg.)

Master of Science in Teaching (M.S.T.) with program in one of the following:

- Astronomy
- Botany
- Chemistry
- Geography
- Geology
- Mathematics
- Physics
- Psychology
- Zoology

Master of Statistics (M.Stat.)

Engineer (Engr.)—A special degree requiring one year of graduate work beyond the master's degree. For a list of the approved programs, see those listed above for the Master of Engineering degree. (Thesis optional.)

Specialist in Education (Ed.S.)—A special degree requiring one year of graduate work beyond the master's degree. For a list of the approved programs, see those listed below, for the Doctor of Education degree.

THESIS DEGREES

(Dagger (†) indicates nonthesis option)

Master of Architecture (M.Arch.)

Master of Arts (M.A.) with program in one of the following:

- Anthropology†
- Art Education
- Art History
- Business Administration:
  - *Decision and Information Sciences†*
  - *Finance*
  - *Insurance*
  - *Management*
  - *Marketing†*
  - *Real Estate and Urban Analysis†*
- Classics
- Communication Processes and Disorders:
  - *Communication Sciences and Disorders†*
  - *Communication Studies†*
- Economics†
- English†
- French†
- Geography
- German†
- History†
- Latin
- Latin American Studies
- Linguistics
- Mathematics†
- Philosophy†
- Political Science†
- Political Science—International Relations†
- Psychology†
- Religion
- Sociology†
- Spanish†

Master of Arts in Education—For a list of the programs, see those listed for the Master of Education degree.

Master of Arts in Mass Communication (M.A.M.C.)†

Master of Arts in Urban and Regional Planning (M.A.U.R.P.)

Master of Fine Arts (M.F.A.) with program in one of the following:

- Art
- English
- Theatre

Master of Landscape Architecture (M.L.A.)

Master of Music (M.M.) with program in one of the following:

- Music
- Music Education

Master of Science (M.S.) with program in one of the following:

- Aerospace Engineering†
- Agricultural Education and Communication
  - *Farming Systems†*
- Agricultural Engineering†
- Agronomy
- Animal Science
- Astronomy†
- Biochemistry and Molecular Biology
- Botany
- Chemical Engineering
- Chemistry
- Civil Engineering†
- Coastal and Oceanographic Engineering†
- Computer and Information Sciences†
- Computer Engineering†
- Dairy Science
- Electrical Engineering†
- Engineering Mechanics†
- Engineering Science†
- Entomology and Nematology
- Environmental Engineering Sciences†
- Food and Resource Economics†
- Food Science and Human Nutrition†
- Forest Resources and Conservation
- Geography
- Geology
- Horticultural Science:
  - *Environmental Horticulture*
  - *Horticultural Sciences*
- Industrial and Systems Engineering†
- Materials Science and Engineering†
- Mathematics†
- Mechanical Engineering†
- Medical Sciences:
  - *Cell and Developmental Biology†*
  - *Immunology and Medical Microbiology*
  - *Neuroscience*
  - *Pathology*
  - *Pharmacology*
  - *Physiology*
- Microbiology and Cell Science
- Nuclear Engineering Sciences†
- Physics†
- Plant Molecular and Cellular Biology
- Plant Pathology
- Poultry Science
- Psychology†
  - *Clinical and Health Psychology*
  - *Psychology*
- Soil and Water Science
- Veterinary Medical Sciences
- Zoology

Master of Science in Architectural Studies (M.S.A.S.)

Master of Science in Building Construction (M.S.B.C.)

Master of Science in Exercise and Sport Sciences (M.S.E.S.S.)

Master of Science in Health Science Education (M.S.H.S.E.)

Master of Science in Nursing (M.S.Nsg.)

Master of Science in Pharmacy (M.S.P.) with program in Pharmaceutical Sciences:

- *Medicinal Chemistry*
- *Pharmacodynamics*
- *Pharmacy*

Master of Science in Recreational Studies (M.S.R.S.)†

Master of Science in Statistics (M.S.Stat.)

Doctor of Education (Ed.D.) with program in one of the following:

- Agency Correctional and Developmental Counseling
- Counselor Education**
- Curriculum and Instruction
- Educational Leadership
- Educational Psychology
- Foundations of Education
- Higher Education Administration
- Research and Evaluation Methodology
- School Counseling and Guidance
- School Psychology
- Special Education
- Student Personnel in Higher Education

Doctor of Philosophy (Ph.D.) with program in one of the following:

- Aerospace Engineering
- Agency Correctional and Developmental Counseling
- Agricultural Engineering
- Agronomy
- Animal Science
- Anthropology
- Architecture
- Astronomy
- Biochemistry and Molecular Biology
- Botany
- Business Administration:
  - *Accounting*
  - *Decision and Information Sciences*
  - *Finance*
  - *Insurance*
  - *Management*
  - *Marketing*
  - *Real Estate and Urban Analysis*
- Chemical Engineering
- Chemistry
- Civil Engineering
- Coastal and Oceanographic Engineering
- Communication Processes and Disorders:
  - *Communication Sciences and Disorders*
  - *Communication Studies*
- Computer and Information Sciences
- Computer Engineering
- Counselor Education
- Counseling Psychology
- Curriculum and Instruction
- Economics
- Educational Leadership
- Educational Psychology
- Electrical Engineering
- Engineering Mechanics
- English
- Entomology and Nematology
- Environmental Engineering Sciences
- Food and Resource Economics
- Food Science and Human Nutrition
  - *Food Science*
  - *Nutritional Sciences*
- Forest Resources and Conservation
- Foundations of Education
- Geography
- Geology
- German
- Health and Human Performance
- Higher Education Administration
- History
- Horticultural Science:
  - *Environmental Horticulture*
  - *Horticultural Sciences*
- Industrial and Systems Engineering
- Linguistics
- Mass Communication
- Materials Science and Engineering
- Mathematics
- Mechanical Engineering
- Medical Sciences:
  - *Cell and Developmental Biology*
  - *Immunology and Medical Microbiology*
  - *Neuroscience*
  - *Oral Biology*
  - *Pathology*
  - *Pharmacology*
  - *Physiology*
- Microbiology and Cell Science
- Music Education
- Nuclear Engineering Sciences
- Nursing Sciences
- Pharmaceutical Sciences:
  - *Medicinal Chemistry*
  - *Pharmacodynamics*
  - *Pharmacy*
- Philosophy
- Physics
- Plant Molecular and Cellular Biology
- Plant Pathology
- Political Science
- Political Science—International Relations
- Psychology:
  - *Clinical and Health Psychology*
  - *Psychology*
- Research and Evaluation Methodology
- Romance Languages:
  - *French*
  - *Spanish*
- School Counseling and Guidance
- School Psychology
- Sociology
- Soil and Water Science
- Special Education
- Statistics
- Student Personnel in Higher Education
- Veterinary Medical Sciences
- Zoology

**Not available for Specialist in Education degree

ADMISSION TO THE GRADUATE SCHOOL

Application for Admission.—Admission forms and information concerning admission procedures may be obtained from the Registrar and Admissions Office. Prospective students are urged to apply for admission as early as possible. For some departments deadlines for receipt of admission applications may be earlier than those stated in the current University Calendar; prospective students should check with the appropriate department. Applications which meet minimum standards are referred to the graduate selection committees of the various colleges and departments for approval or disapproval.

To be admitted to graduate study in a given department, the prospective student must satisfy the requirements of the department as well as those of the Graduate School. Admission to some programs is limited by the resources available.

General Requirements.—The Graduate School, University of Florida, requires *both* a minimum grade average of B for all upper-division undergraduate work *and* acceptable scores on the verbal, quantitative, and analytical sections on the GRE General Test. Although no cut-off GRE scores are used, the Graduate School uses, as a guide for admission, scores at or above the national mean score on each section. For some departments, and in more advanced levels of graduate study, undergraduate averages or Graduate Record Examination scores above those stated for the Graduate School may be required. Inquiries about specific requirements should be addressed to the department in question. Some colleges and departments require a reading knowledge of at least one foreign language. Exceptions to the above requirements are made only when these and other criteria, including letters of recommendation, are reviewed by the department, recommended by the department, and approved by the Dean of the Graduate School.

Direct admission to the Graduate School is dependent upon the presentation of a baccalaureate degree from an accredited college or university. No application will be considered unless the complete official transcript of all the applicant's undergraduate and graduate work is in the possession of the University Registrar, and no transcript will be accepted as official unless it is received directly from the registrar of the institution in which the work is done. Official supplementary transcripts are required as soon as they are available for any work completed after application for admission has been made.

The Board of Regents has also ruled that, in admitting students for a given academic year, up to 10% may be admitted as exceptions. Students admitted as exceptions under the 10% waiver rule must present both an upper-division grade point average and Graduate Record Examination General Test score with their applications and meet other criteria required by the University, including excellent letters of recommendation from colleagues, satisfactory performance in a specified number of graduate courses taken as postbaccalaureate students, and/or practical experience in the discipline for a specified period of time.

The University encourages applications from qualified applicants of both sexes from all cultural, racial, religious, and ethnic groups. The University does not discriminate on the basis of handicap or age in admission or access to its programs and activities. The Title IX Coordinator is Dr. Jacquelyn D. Hart, 352 Tigert Hall, 392-6004.

ADMISSIONS EXAMINATIONS

Graduate Record Examination.—In addition to the General Test of the Graduate Record Examination which is required of all applicants, some departments encourage the applicant to submit scores on one or more advanced subject tests of the Graduate Record Examination. The scores on all tests taken will be considered in regard to admission.

Graduate Study in Business Administration.—Students applying for admission to the Graduate School for study in the College of Business Administration may substitute satisfactory scores on the Graduate Management Admission Test (GMAT) for the Graduate Record Examination. Students applying for admission to the Master of Business Administration (MBA) program *must* submit satisfactory scores on the GMAT. Applicants should contact the Educational Testing Service, Princeton, NJ, for additional information.

Graduate Study in Law.—Students applying to the graduate program leading to the degree Master of Laws in Taxation must hold the Juris Doctor or equivalent degree and must submit satisfactory scores on the Law School Admission Test (LSAT).

FOREIGN STUDENTS

All foreign students seeking admission to the Graduate School are required to submit satisfactory scores on the GRE General Test and a score of at least 550 on the TOEFL (Test of English as a Foreign Language) with the following exceptions:

1. Foreign students whose native tongue is English or who have studied at a United States college or university for one year or more need not submit TOEFL scores but must submit satisfactory scores on the General Test of the Graduate Record Examination before their applications for admission can be considered.

2. Students educated in foreign countries that do not offer the GRE who apply for admission while residing outside the United States may be granted, on the basis of hardship, a one-semester postponement of the GRE but not the TOEFL. Permission to register for subsequent semesters will depend upon the submission of scores on the Graduate Record Examination.

3. All foreign students applying for admission for the Master of Business Administration program must submit satisfactory scores from the Graduate Management Admission Test before their applications for admission will be considered.

Foreign students whose scores on the TOEFL and verbal portion of the GRE are not indicative of adequate writing skills are required to write a short essay for examination. If the skills demonstrated in the essay are not acceptable for pursuing graduate work, the examination will be used as a diagnostic tool for placement in appropriate courses which will not count toward a graduate degree.

Graduate students whose native language is not English must submit satisfactory scores on the Test of Spoken English (TSE) or the SPEAK Test to be eligible for teaching assignments. Students who score below 220 on one of these tests must take ENS 5501—Academic Spoken English I before they may accept teaching assistantships. Students

who score between 220 and 249 must take ENS 5502—Academic Spoken English II; this requirement must be met while holding a teaching assignment.

Applicants should write to the Educational Testing Service, Princeton, New Jersey, for registration forms and other information concerning TOEFL, TSE, GMAT, and GRE. Students may register for the locally administered SPEAK test with the Academic Spoken English Office, 1349 Norman Hall.

STUDENTS WITH DISABILITIES

The University of Florida does not discriminate on the basis of disability in the recruitment and admission of students, in the recruitment and employment of faculty and staff, or in the operation of any of its programs and activities, as specified by federal laws and regulations. The designated coordinator for compliance with Section 504 of the Rehabilitation Act of 1973, as amended,and the Americans with Disabilities Act (ADA) is Kenneth J. Osfield, Assistant Dean for Student Services, 202 Peabody Hall, 392-1261.

The Office of Student Services provides assistance for students with disabilities. Services are varied depending on individual needs and include, but are not limited to, special campus orientation, registration assistance, help in securing auxiliary learning aids, and assistance in general University activities. Students with disabilities are encouraged to contact this office.

CONDITIONAL ADMISSION

Students who are not eligible for direct admission may be granted conditional admission to the Graduate School. Students may be granted conditional admission to defer final admission decisions until requisite examination scores or final grade records are available. Students may also be granted conditional admission to ascertain their ability to pursue graduate work at the University of Florida if previous grade records or Graduate Record Examination scores are on the borderline of acceptability or when specific prerequisite courses are required.

Students granted conditional admission should be notified by the department of the conditions under which they are admitted. When these conditions have been satisfied, the department must notify the student in writing, sending a copy to the Graduate School. Eligible course work taken while a student is in conditional status is applicable toward a graduate degree.

Students failing to meet any condition of admission will be barred from further registration.

POSTBACCALAUREATE STUDENTS

Students who have received a bachelor's degree but have *not* been admitted to the Graduate School are classified as postbaccalaureate students (6—). Postbaccalaureate enrollment is offered for the following reasons: (1) to provide a means for students *not seeking a graduate degree* to enroll in courses—included in this category would be students who change their professional goals or wish to expand their academic backgrounds and (2) to accommodate students who *do intend* to enter a graduate program at some future date, but need a substantial number of prerequisite courses.

Postbaccalaureate students may enroll in graduate courses but the work taken will not normally be transferred to the graduate record if the student is subsequently admitted to the Graduate School. By petition in clearly justified cases and in conformance with regulations on courses and credit, it is possible to transfer up to eight semester hours of course work earned with a grade of A, B+, or B.

Students who wish to enter the College of Education to obtain teacher certification may not complete a program as postbaccalaureate students. A department may accept students in postbaccalaureate status for a limited time to meet admission requirements for a master's degree. Interested students should write to 134 Norman Hall or call 392-0721 ext. 400 for further information.

FACULTY MEMBERS AS GRADUATE STUDENTS

University of Florida faculty in tenured or tenure-accruing lines, as designated by the Florida Administrative Code, may not pursue graduate degrees from this institution. Exceptions are made for the Florida Cooperative Extension Service (IFAS) county personnel, the faculty of the P. K. Yonge Laboratory School, and University Libraries faculty.

Under certain restrictions established by the Graduate Council, persons holding nontenure- or nonpermanent-status-accruing titles may pursue nonthesis master's degrees at the University of Florida. Any other exceptions to this policy must be approved by the Graduate Council. Such exceptions, if given, are extremely rare and will only be approved when it is determined to be in the best interest of the University.

STATE UNIVERSITY SYSTEM PROGRAMS

Traveling Scholar Program.—This program makes the entire State University System graduate curriculum available to University of Florida graduate students. A course or research activity not offered on this campus, taken under the auspices of the Traveling Scholar Program at another SUS university, will count as credit at the University of Florida if approved by the graduate coordinator or the supervisory committee chair and the Dean of the Graduate School. Traveling scholars are normally limited to one term on the campus of the host university. The deans of graduate schools of the state universities are the coordinators of the program, and interested students should contact the Graduate Student Records Office, 288 Grinter Hall.

Cooperative Degree Programs.—In certain degree programs, faculty from other universities in the State University System hold graduate faculty status at the University of Florida. In those approved areas, the intellectual resources of these graduate faculty members are available to students at the University of Florida.

GENERAL REGULATIONS

It is the responsibility of the graduate student to become informed and to observe all regulations and procedures required by the program the student is pursuing. The student must be familiar with those sections of the *Graduate Catalog* that outline general regulations and requirements, specific degree program requirements, and the offerings and requirements of the major department. **Ignorance of a rule does not constitute a basis for waiving that rule.** Any exceptions to the policies stated in the *Graduate Catalog* must be approved by the Dean of the Graduate School.

After admission to the Graduate School, but before the first registration, the student should consult the college and/or the graduate coordinator in the major department concerning courses and degree requirements, deficiencies if any, and special regulations of the department. The dean of the college in which the degree program is located or a representative must approve all registrations. Once a supervisory committee has been appointed, registration approval should be the responsibility of the chair.

CONFIDENTIALITY OF STUDENT RECORDS

The University of Florida assures the confidentiality of student educational records in accordance with the State University System rules, state statutes, and the Family Educational Rights and Privacy Act of 1974 (known as the Buckley Amendment).

Information which may be released to the public on any student is the name; class, college, and major; dates of attendance; degree(s) earned; awards received; local and permanent address; and telephone number.

In general, a present or former student has the right to personally review his or her own educational records for information and to ascertain the accuracy of these records. Parents of dependent students, as defined by the Internal Revenue Service, have these same rights. A photo I.D. or other equivalent documentation or personal recognition by the custodian of record will be required before access is granted.

STUDENT CONDUCT

Graduate students are subject to the same rules of behavior that govern undergraduates. The student conduct code is printed in the *Undergraduate Catalog*.

STUDY LOADS

The University of Florida operates on a semester system consisting of two 16-week periods and two 6-week summer terms. A credit under the semester system is equal to 1.5 quarter credits.

Minimum registration for full-time graduate students, including trainees and fellows, is 12 credits. The minimum registration requirement is reduced for those students who are graduate assistants. Guidelines for minimum registration for students on appointment are provided in the *Graduate Student Handbook* and the *Graduate Council Policy Manual for Coordinators*, as well as in the *Financial Aid* section of this *Catalog*.

Full-time students, not on appointment, must register for a minimum of 12 credits. Part-time status may be approved by the graduate coordinator or student's adviser for students who are not pursuing a degree on a full-time basis. Such exceptions must be clearly justified and the approved registration must be commensurate with the use of University facilities and faculty time.

The minimum study load for students not on assistantship is three credits during Fall and Spring Semesters and two for Summer.

COURSES AND CREDITS

Undergraduate courses (1000-2999) may not be used as any part of the graduate degree requirements, including the requirement for a period of concentrated study. Undergraduate courses (3000-4999), outside the major department, may be used for support course work when taken as part of an approved graduate program.

Courses numbered 5000 and above are limited to graduate students, with the exception described under *Undergraduate Registration in Graduate Courses*. Courses numbered 7000 and above are designed primarily for advanced graduate students.

No more than five hours each of 6910 (Supervised Research) and 6940 (Supervised Teaching) may be taken by a graduate student at the University of Florida.

A complete list of approved graduate courses appears in the section of this *Catalog* entitled *Fields of Instruction*. Departments reserve the right to decide which of these graduate courses will be offered in a given semester and the departments should be consulted concerning available courses.

Generally speaking graduate courses may not be repeated for credit. However, there is no limit on courses numbered 6971, 6972, 6979, 7979, and 7980. Other courses that may be repeated for credit are designated by **max:** immediately following the semester credit designation.

Graduate students must conform to the Registrar's deadline for drops. However, under certain circumstances, substitutions of courses, if approved by the Graduate School, are permitted after the Registrar's deadline.

Correspondence Work.—No courses taken by correspondence may be used for graduate credit.

Professional Work.—No courses from a professional curriculum (e.g., J.D., D.V.M., or M.D.) may be used for graduate credit except as approved in an authorized joint degree program.

GRADES

The only passing grades for graduate students are A, B+, B, C+, C, and S. Grades of C+ and C in courses below 5000 level are acceptable for credit toward graduate degrees if the total program meets the B average requirement. In 5000-level courses and above, C+ and C grades count toward a graduate degree if an equal number of credit hours in courses numbered 5000 or higher have been earned with grades of B+ and A, respectively. Grade points are not designated for S and U grades; these grades are not used in calculating the grade-point average.

Grades of S and U are the *only* grades awarded in courses numbered 6910 (Supervised Research), 6940 (Supervised Teaching), 6971 (Master's Research), 6972 (Engineer's Research), 6973 (Individual Project), 7979 (Advanced Research), and 7980 (Doctoral Research). Additional courses

for which S and U grades apply are noted in the departmental offerings.

All language courses regardless of level may be taken S/U if the student's major is not a language and the courses are not used to satisfy a minor. Approval is required from the student's supervisory committee chair and the instructor of the course. S/U approval should be made within the first day of each semester counted from the first three weeks of classes. All 1000 and 2000 level courses may be taken S/U. No other courses—graduate, undergraduate, or professional—may be taken for an S/U grade.

Deferred Grade H.—The grade of H is *not* a substitute for a grade of S, U, or I. Courses for which H grades are appropriate *must* be so noted in their catalog descriptions, and must be approved by the Graduate Curriculum Committee and the Graduate School. This grade may be used only in special situations where the expected unit of work may be developed over a period of time greater than a single term.

Incomplete Grades.—Grades of I (incomplete) received during the preceding semester should be removed as soon as possible. Grades of I carry no quality points and lower the overall grade-point average.

All grades of H and I must be removed prior to the award of a graduate degree.

UNDERGRADUATE REGISTRATION IN GRADUATE COURSES

With the permission of the instructor and the college concerned, an undergraduate student at the University of Florida may enroll in graduate-level courses (5000 and 6000 level) if the student has senior standing and an upper-division grade-point average of at least 3.0. After a student has been accepted in the Graduate School, up to six hours of graduate-level courses earned with a grade of A, B+, or B taken under this provision may be applied toward a graduate degree at the University of Florida provided credit for the course has not been used for an undergraduate degree and provided the transfer is approved by the department and made as soon as the student is admitted to a graduate program.

CONCURRENT GRADUATE PROGRAMS

A graduate student who wishes to pursue degrees in two programs concurrently must have the written approval of the chairperson of each department involved and the Dean of the Graduate School. Any student interested in pursuing concurrent degrees should discuss the proposed study with the Graduate School's Student Records staff *prior* to applying for the programs. If the request is approved, the student must be officially admitted to both programs through regular procedures. If the student is approved to pursue two master's programs, no more than six hours of course work from one degree program may be applied toward meeting the requirements for the second master's degree. These six hours must be by petition to the Dean of the Graduate School.

INFORMATION FOR VETERANS

The University of Florida is approved for the education and training of veterans under all public laws in effect; i.e., Chapter 31, Title 38, U.S. Code (Disabled Veterans); Chapter 34, Title 38, U.S. Code (Cold-War G.I. Bill); and Chapter 35, Title 38, U.S. Code (Children of Deceased or Disabled Veterans).

Students who may be eligible for educational benefits under any Veterans Administration program are urged to contact the Veterans Affairs Office, as soon as they are accepted for admission.

Students expecting to receive benefits under one of these programs must file an application with the Office of the Registrar. No certification can be made until the application is on file. Benefits are determined by the Veterans Administration, and the University certifies according to these rules and regulations.

The Office of the University Registrar maintains students' academic records. A progress report is sent to each student at the end of the term indicating grades, cumulative hours, grade points, etc.

UNSATISFACTORY SCHOLARSHIP

Any graduate student may be denied further registration in the University or in a graduate program should scholastic performance or progress toward completion of the planned program become unsatisfactory to the department, college, or Dean of the Graduate School. Failure to maintain a B average in all work attempted is, by definition, unsatisfactory scholarship.

CHANGE OF MAJOR OR COLLEGE

A graduate student who wishes to change major or college must make formal application through the Office of the University Registrar and receive approval of the appropriate department chairperson, college dean, and the Dean of the Graduate School. Deadline dates for such changes as specified in the current *University Calendar* must be met.

FOREIGN LANGUAGE EXAMINATION

A foreign language examination is not required for all degree programs and the student should contact the graduate coordinator in the appropriate department for specific information regarding any requirement of a foreign language.

If a department requires that a student meet the foreign language requirement by satisfactory performance on the Graduate School Foreign Language Tests (GSFLT) in French, Spanish, or German, the student should contact the Office of Instructional Resources, 1012 Turlington Hall, for applications and payments of fees. The examination times and dates are listed in the *University Calendar*. Educational Testing Service (ETS) no longer administers this examination and does not accept application fees or issue tickets of admission for these tests.

EXAMINATIONS

The student must be registered for an appropriate load during the semester in which any examination is taken. The student's supervisory committee is responsible for the administration of the written and oral qualifying examinations as well as the final oral examination for the defense of the thesis, project, or dissertation. *All* members of the supervisory committee must sign the appropriate forms, including the signature pages, in order for the student to satisfy the requirements of the examination.

Qualifying and final examinations for graduate students are to be held on the University of Florida campus. Exceptions to this policy are made only for certain graduate students whose examinations are administered at the Agricultural Research and Educational Centers or on the campuses of the universities in the State University System.

With the approval of all members of the supervisory committee, one committee member may be off-site at a qualifying oral examination or at the final oral defense of the dissertation or thesis, using modern communication technology to be present rather than being physically persent.

PREPARATION FOR FINAL SEMESTER

It is the student's responsibility to ascertain that all requirements have been met and that every deadline is observed. Deadline dates are set forth in the *University Calendar* and by the college, school, or department. Regular issues of *Deadline Dates* are available each semester.

When the dissertation or thesis is ready to be put in final form, the student should obtain the *Guide for Preparing Theses and Dissertations* from the Graduate School Editorial Office and should request a records check in the Graduate Records Office to make certain that *all* requirements for graduation have been fulfilled.

During the term in which the final examination is given and during the term the degree is received, a student must be registered for at least three hours that count toward his/her graduate degree. Thesis students must be registered for three hours of 6971 and doctoral students for three hours of 7980. Minimum registration for students taking their final examinations or graduating during the summer terms is two hours of appropriate credit as outlined above. Students must also apply for the degree at the beginning of the final term.

AWARDING OF DEGREES

The Graduate School will authorize a candidate to be awarded the degree appropriate to the course of study under the following conditions (the details of which can be found under the descriptions of the several degrees):

1. The candidate must have completed all course requirements, including an internship or practicum if required, in the major and minor fields, observing time limits, limitations on transfer credit, on nonresident work, and on level of course work.

2. The candidate must have a grade average of B or higher in the major and in all work attempted in the graduate program. All grades of I, H, and X must be resolved. Grades of D and E require a written petition to the Dean of the Graduate School.

3. The candidate must have satisfactorily completed all required examinations, qualifying, comprehensive, and final, and be recommended for the degree by the supervisory committee, major department, and college.

4. The dissertation or, if required, thesis or equivalent project, must have been approved by the supervisory committee and accepted by the Graduate School. Recommendations for the awarding of a degree include meeting all academic and professional qualifications as judged by the faculty of the appropriate department.

5. All requirements for the degree must be met while the candidate is a registered graduate student.

Students who have been registered in the Graduate School at least one semester of each successive calendar year may graduate according to the curriculum under which they entered.

ATTENDANCE AT COMMENCEMENT

Graduates who are to receive advanced degrees are urged to attend Commencement in order to accept personally the honor indicated by the appropriate hood. The student may arrange through the University Bookstore for the proper academic attire to be worn at Commencement.

REQUIREMENTS FOR MASTER'S DEGREES

GENERAL REGULATIONS

The following regulations represent those of the Graduate School. Colleges and departments may have additional regulations beyond those stated below. **Unless otherwise indicated in the following sections concerning master's degrees, these general regulations apply to all master's degree programs at the University.**

Course Requirements.—Graduate credit is awarded for courses numbered 5000 and above. The work in the major field must be in courses numbered 5000 or above. For work outside the major, courses numbered 3000 or above may be taken provided they are part of an approved plan of study. The program of course work for a master's degree must be approved by the student's adviser, supervisory committee, or faculty representative of the department. No more than six credits from a previous master's degree program may be applied toward a second master's degree. These credits are applied only with the written approval of the Dean of the Graduate School.

If a minor is chosen, at least six credits of work are required in the minor field. Two six-credit minors may be taken with departmental permission. **Minor work must be in a department other than the major;** in special cases this requirement may be modified, but only with the written

permission of the Dean of the Graduate School. A GPA of 3.0 is required for minor credit.

Degree Requirements.—Unless otherwise specified, for any master's degree, the student must earn a minimum of 30 credits as a graduate student at the University of Florida, of which no more than eight hours, earned with a grade of A, B+, or B, may be transferred from institutions approved for this purpose by the Dean of the Graduate School. At least half of the required credits, exclusive of 6971, must be in the field of study designated the major.

Transfer of Credit.—Only graduate (5000-7999) level work to the extent of eight semester hours, earned with a grade of A, B+, or B may be transferred from an institution approved by the Graduate School or from postbaccalaureate work at the University of Florida. Credits transferred from other universities will be applied toward meeting the degree requirements but the grades earned will not be computed in the student's grade-point average. Acceptance of transfer of credit requires approval of the student's supervisory committee and the Dean of the Graduate School.

Petitions for transfer of credit for a master's degree must be made during the student's first term of enrollment in the Graduate School.

Nonresident or extension work taken at another institution may not be transferred to the University of Florida for graduate credit. No courses taken by correspondence or as part of a professional degree may be used toward a graduate degree.

Supervisory Committee.—The student's supervisory committee should be appointed as soon as possible after the student has been admitted to the Graduate School but in no case later than the second semester of graduate study.

Supervisory committees for graduate degree programs are nominated by the representative department chairperson, approved by the college dean, and appointed by the Dean of the Graduate School. Only members of the graduate faculty may be appointed to supervisory committees. The chairperson must be from the major department. The Dean of the Graduate School is an ex-officio member of all supervisory committees.

The supervisory committee for a master's degree with a thesis must consist of at least two members selected from the graduate faculty. The supervisory committee for a master's degree without a thesis may consist of one member of the graduate faculty who advises the student and oversees the program. If a minor is designated, the committee must include one graduate faculty member from the minor department.

Language Requirements.—(1) The requirement of a reading knowledge of a foreign language is at the discretion of the department. The foreign language requirement varies from department to department and the student should check with the appropriate department for specific information. (2) The ability to use the English language correctly and effectively, as judged by the supervisory committee, is required of all candidates.

Examination.—A final comprehensive examination must be passed by the candidate. This examination, held on campus with all participants present, will cover at least the candidate's field of concentration, and in no case may it be scheduled earlier than the term preceding the semester in which the degree is to be conferred.

Time Limitation.—All work, including transferred credit, counted toward the master's degree must be completed during the seven years immediately preceding the date on which the degree is awarded.

MASTER OF ARTS AND MASTER OF SCIENCE

The requirements for the Master of Arts and the Master of Science degrees also apply to the following degrees, except as they are individually described hereafter: Master of Arts in Education, Master of Arts in Mass Communication, Master of Science in Building Construction, Master of Science in Health Science Education, Master of Science in Pharmacy, Master of Science in Recreational Studies, and Master of Science in Statistics.

Course Requirements.—The minimum course work required for a master's degree with thesis is 30 credits including up to 6 hours of the research course numbered 6971. All students seeking a master's degree with thesis must register for an appropriate number of hours in 6971.

The Graduate School requirement for a Master of Arts or Master of Science taken with a nonthesis option is at least 32 letter-graded credits. Many departments require more. S/U graded courses do not count in meeting the minimum credit requirements for a nonthesis option. Students pursuing the nonthesis option may not use the course numbered 6971.

For both nonthesis option and thesis programs, at least half the required credits, exclusive of 6971, must be in a field of study designated the major. One or two minors of at least six credits each may be taken, but a minor is not required by the Graduate School. Minor work must be in a department other than the major. The work in the major field must be in courses numbered 5000 or above. For work outside the major, courses numbered 3000 or above may be taken.

Engineering students, working at off-campus centers, who are pursuing a nonthesis option Master of Science degree, must take half the course work from full-time University of Florida faculty members and are required to pass a comprehensive written examination administered on the University of Florida campus by an examining committee recommended by the Dean of the College of Engineering and appointed by the Dean of the Graduate School.

Thesis.—Candidates for the master's degree with thesis must prepare and present theses (or equivalent in creative work) acceptable to their supervisory committees and the Graduate School. The candidate should consult the Graduate School Editorial Office for instructions concerning the form of the thesis. The *University Calendar* specifies final dates for submitting the original copy of the thesis to the Graduate School. The college copy should also be submitted to the college or to the library by the specified date. After the thesis is accepted, these two copies will be permanently bound and deposited in the University Libraries.

Change from Thesis to Nonthesis Option.—A student who wishes to change from the thesis to the nonthesis option for the master's degree must obtain the permission of the supervisory committee to make such a change. This permission must be forwarded to the Graduate School at least one full semester prior to the intended date of graduation. The candidate must meet all the requirements of the nonthesis option as specified above. A maximum of three credits earned with a grade of S in 6971 (Master's Research) can be counted toward the degree requirements only if converted to credit as A, B+, or B in Individual Work. The supervisory commitee must indicate that the work was productive in and by itself and warrants credit as a special problem or special topic course.

Supervisory Committee.—The student's supervisory committee should be appointed as soon as possible after the student has been admitted to the Graduate School but in no case later than the end of the second semester of study. The duties of the supervisory committee are to advise the student, to check on the student's qualifications and progress, to supervise the preparation of the thesis, and to conduct the final examination.

Final Comprehensive Examination.—The student who elects the nonthesis option must pass a comprehensive written examination on the major field of study and on the minor if a minor is designated. This comprehensive examination must be taken within six months of the date the degree is to be awarded.

Final Examination.—When the student's course work is substantially completed, and the thesis is in final form, the supervisory committee is required to examine the student orally or in writing on (1) the thesis, (2) the major subjects, (3) the minor or minors, and (4) matters of a general nature pertaining to the field of study. A written announcement of the examination must be sent to the Dean of the Graduate School.

At least three faculty members and the candidate must be present at the final examination. At the time of the examination, all committee members should sign the signature pages and the Final Examination Report. These may be retained by the supervisory chair until acceptable completion of corrections. This examination may not be scheduled earlier than the semester preceding the term the degree is to be conferred.

MASTER OF ARTS IN TEACHING AND MASTER OF SCIENCE IN TEACHING

These degrees are designed for graduate students who intend to teach in junior colleges. Requirements for admission are the same as those for the regular M.A. and M.S. degrees in the various colleges, and programs leading to the M.A.T. and M.S.T. may, with proper approval, be incorporated into programs leading to the Ph.D.

The requirements for the degrees are as follows:

1. A reading knowledge of one foreign language if required by the student's major department.

2. Satisfactory completion of at least 36 credits while registered as a graduate student, with work distributed as follows:

   a. At least 18 credits in the major (all work in the major field must be 5000 level or higher) and 6 credits in the minor.
   b. Six credits in a departmental internship in teaching (6943—Internship in College Teaching). Three years of successful teaching experience in a state certified school may be substituted for the internship requirement, and credits thus made available may be used for further work in the major, the minor, or in education.
   c. At least one course in each of the following: social foundations of education, psychological foundations of education, and community college curriculum. These courses may be used to comprise a minor.

3. **Off-Campus Work:** A minimum of 8-16 credits (at the department's discretion), including registration for at least 6 credit hours in a single semester, must be earned on the Gainesville campus. Beyond that, credits, including those at the 5000 and 6000 level, earned in courses offered off-campus by the University of Florida which have been approved by the Graduate School shall be accepted, provided they are appropriate to the student's degree program as determined by the supervisory committee.

4. At the completion of this degree, the student, for certification purposes, must present from the undergraduate and graduate degree programs no fewer than 36 semester credits in the major field.

5. A final comprehensive examination, either written, oral, or both, must be passed by the candidate. This examination, taken on campus, will cover the field of concentration and the minor.

MASTER OF ACCOUNTING

The Master of Accounting (M.Acc.) is the professional degree for students seeking careers in public accounting, business organizations, and government. The M.Acc. program offers specializations in each of the three areas of auditing/financial accounting, management accounting, accounting systems, and taxation.

The recommended curriculum to prepare for a professional career in accounting is the 3/2 five-year program with a joint awarding of the Bachelor of Science in Accounting and the Master of Accounting upon satisfactory completion of the 156-hour program. The entry point into the 3/2 is the beginning of the senior year.

Students who have already completed an undergraduate degree in accounting may enter the one-year M.Acc. program which requires satisfactory completion of 34 hours of course work. A minimum of 16 semester credits must be in graduate level accounting courses. At least 20 of the 34 semester credits must be in graduate level courses. Courses below the graduate level must have the approval of the major adviser. A final comprehensive examination, taken on campus, is required of all students. Additional requirements are listed under the *General Regulations* section for all master's degrees.

M.Acc./J.D. Program.—This joint program culminates in both the Juris Doctor degree awarded by the College of Law and the Master of Accounting degree awarded by the Graduate School. The program is designed for students who have an undergraduate degree in accounting and who are interested in advanced studies in both accounting and law. The joint program requires 20 fewer credits than would be required if the two degrees were earned separately. The two degrees are awarded after completion of the curriculum requirements for both degrees. Students must take both the GMAT (or the GRE) and the LSAT prior to admission, and must meet the admission requirements for the College of Law (J.D.) and the Fisher School of Accounting (M. Acc.). Students must be admitted to the two programs simultaneously.

MASTER OF AGRICULTURE

The degree of Master of Agriculture is designed for those students who wish additional training for agribusiness occupations or professions rather than for those interested primarily in research.

The general requirements are the same as those for the Master of Science degree without thesis except that 12 credits of graduate courses in a department constitute a major. Credit toward the degree for courses taken through the Division of Continuing Education is limited to 24 credits. The student's supervisory committee must consist of at least two members of the graduate faculty. A comprehensive written qualifying examination, given prior to the midpoint of the term of graduation, and a final oral ex-

amination are required. Both examinations must be given on campus with all participants present.

MASTER OF AGRICULTURAL MANAGEMENT AND RESOURCE DEVELOPMENT (M.A.M.R.D.)

The M.A.M.R.D. degree program provides an opportunity for graduate study for students who plan to enter management careers in business firms or government agencies; it is not recommended for those who plan careers in research and university teaching. Areas of concentration include farm management, agribusiness management, and natural resources and environmental management.

The general requirements are the same as those for the Master of Science degree without thesis except that 12 credits of graduate courses in food and resource economics constitute a major. The supervisory committee and examination requirements are the same as those for the Master of Agriculture degree.

MASTER OF ARCHITECTURE

The degree of Master of Architecture is an accredited professional degree meeting the requirements of the National Architectural Accrediting Board, for those students who wish to qualify for registration and practice as architects. Candidates are admitted from architectural, related, and unrelated undergraduate backgrounds; professional experience is encouraged but not required.

The general requirements are the same as those for the Master of Arts degrees with thesis except that the minimum registration required is 52 credits, including no more than 6 credits in ARC 6971 or 6979. Course sequences in design history and theory, materials and methods, structures, technology, and practice must be completed. Students are encouraged to propose individual programs of study (outside of required courses), and interdisciplinary work is encouraged.

MASTER OF ARTS IN URBAN AND REGIONAL PLANNING

The degree of Master of Arts in Urban and Regional Planning is a professional degree for students who wish to practice urban and regional planning and meet the educational requirements for the American Institute of Certified Planners. The program is accredited by the Planning Accreditation Board.

The general requirements are the same as those for other Master of Arts degrees with thesis except that the minimum registration required is 52 credits including no more than 6 credits in URP 6971. In some study areas, with permission from the departmental graduate faculty, a terminal project requiring 6 credits may be elected in lieu of a thesis.

M.A.U.R.P./J.D. Joint Program.—A four-year program leading to a Juris Doctor and a Master of Arts in Urban and Regional Planning is offered under the joint auspices of the College of Law and the College of Architecture, Department of Urban and Regional Planning. The program provides students interested in the legal problems of urban and regional planning with an opportunity to blend law studies with relevant course work in the planning curriculum. The students receive both degrees at the end of a four-year course of study whereas separate programs would require five years. Students must take the GRE and the LSAT prior to admission, must be admitted to the two programs simultaneously, and must complete the first year of law school course work before comingling law and planning courses. A thesis is required upon completion of the course work.

Interested students should apply to both the Holland Law Center and the Graduate School, noting on the application the joint nature of their admission requests. Further information on the program is available from the Holland Law Center and from the Department of Urban and Regional Planning.

MASTER OF BUILDING CONSTRUCTION

The degree of Master of Building Construction is designed for those students who wish to pursue advanced work in management of construction, construction techniques, and research problems in the construction field.

The general requirements are the same as those for Master of Science degrees except that a minimum of 33 credits is required. At least 24 credits must be in the School of Building Construction in graduate level courses of which at least 15 credits must be earned at the 6000 level. The remaining nine credits may be earned in other departments at the 3000 level or above when these courses are included as a part of an approved program of study. A thesis is not required, but an independent research study (BCN 6934) of at least three credits is required.

When the student's course work is completed, or practically so, and the independent research report is complete, the supervisory committee is required to examine the student orally on (1) the independent research report, (2) the major subjects, (3) the minor or minors, and (4) matters of a general nature pertaining to the field of study. The examination must be given on campus with all participants present.

MASTER OF BUSINESS ADMINISTRATION

The requirements for the Master of Business Administration degree are designed to give students (1) the conceptual knowledge for understanding the functions and behaviors common to all organizations and (2) the analytical, problem-solving, and decision-making skills essential for effective management. The emphasis is upon developing the student's capacities and skills for business decision making.

The curriculum is structured so that students may extend their knowledge in a specialized field. Included are computer and information sciences, decision and information sciences, economics, finance, health and hospital administration, management, marketing, real estate, agribusiness, manufacturing management, arts administration, global management, environment, and entrepreneurship. Students may also expand their knowledge in several areas instead of specializing and pursue a generalist option by selecting approved courses from more than one specialization.

Admission.—Applicants for admission must submit scores from the Graduate Management Admission Test (GMAT) as well as transcripts for all previous academic work. Significant work experience and personal interviews are expected. Applicants whose native language is not English are required to submit, in addition, scores on the Test of English as a Foreign Language.

A heterogeneous student body is seen as an important asset of the program. Accordingly, the backgrounds of students include a wide range of disciplines and cultures. The curriculum assumes no previous academic work in managerial disciplines or business administration. Enrolling students find introductory course work in statistics, calculus, and financial accounting beneficial.

Traditional students are admitted for the fall semester and three-term students begin in June. Applications should be made as early as possible during the preceding academic year; no later than April 1 (February 1 for three-term candidates). For more specific information on admission as well as other aspects of the program, contact the Director of MBA Admissions, College of Business Administration, 134 Bryan Hall.

Course Work Required.—A minimum of 48 credits of course work is required including 27 credits of required courses and 21 credits of elective courses. The latter include specialization courses, an international elective, a course dealing with the legal environment of business, and courses outside the specialization. Most students concentrate in general business specializing in one or more of the areas listed above. A specialization typically requires two courses.

Options.

Full-Time MBA Program.—The traditional MBA program requires four semesters of full-time study. Entering in the fall only, each student spends the summer as an intern or on an international exchange program.

Three-Term MBA Program.—Designed for undergraduate business majors, this one year program begins in June. Two to five years of postgraduate work experience is required.

MBA for Managers.—A two year program designed for working professionals, students attend 16 courses on Saturdays; four terms per year.

MBA/MHS Program in Health and Hospital Administration.—A program of concurrent studies leading to a Master of Business Administration and a Master of Health Science is offered in cooperation with the College of Health Related Professions. Both degrees are awarded after a course of study which requires 66 semester hours of credit. Students apply and are admitted to the Master of Business Administration program following regular procedures. In addition, they are admitted to the Master of Health Science program following an interview with members of a class selection committee. Admission to the two programs must be simultaneous.

MBA/JD Program.—A program of concurrent studies leading to a Master of Business Administration and a Juris Doctor is offered under the joint auspices of the College of Business Administration and the College of Law. Current MBA or JD students may apply for joint enrollment prior to completion of the second consecutive semester. Both degrees are awarded after a four-year course of study. Students must take both the LSAT and the GMAT prior to admission and meet the curriculum requirements of both degrees.

MBA/PharmD Program in Management and Pharmacy Administration.—A program of concurrent studies culminating in both a Master of Business Administration and a Doctor of Pharmacy degree allows students interested in both management and pharmacy administration to obtain the appropriate education in both areas. Candidates must meet the entrance requirements and follow the entrance procedures of both the College of Business Administration and the College of Pharmacy, and admission to the two programs must be simultaneous. The degrees may be granted after five years of study. Further information on the joint program may be obtained from the Director of the Master of Business Administration Program, College of Business Administration.

MBA/MIB Program in International Business Administration.—A joint program which will culminate in Master of Business Administration (conferred by the College of Business Administration, University of Florida) and a Master of International Business (awarded by Nijenrode, The Netherlands School of Business) allows students interested in both management and international business to obtain the appropriate education in both areas. Both degrees may be granted after two years of study; applicants must be simultaneously accepted by both colleges and satisfy the curriculum requirements of each degree. Apply to the Director of MBA Admissions for criteria and current information.

MBA/BSISE.—A joint program culminating in a Bachelor of Science in Industrial and Systems Engineering and a Master of Business Administration is offered under the auspices of the Colleges of Engineering and Business Administration. The two degrees may be granted after approximately six years of course work. An applicant for the combined curriculum must first be admitted to the Department of Industrial and Systems Engineering for study toward the BSISE degree. After completing a minimum of 80 semester hours of course work and with the endorsement of the Department of Industrial and Systems Engineering, the student should apply to the College of Business Administration for the MBA program. To be eligible for the joint program, a student should have a GPA of 3.0 or higher and a competitive GMAT score. Foreign students must also submit TOEFL scores. Further information on the joint program may be obtained from the Director of MBA Admissions.

Exchange Programs.—The MBA program offers second-year students exchange opportunities at numerous international universities. Currently, exchange programs exist with the University of Manchester in England, Bocconi University in Italy, Nijenrode in the Netherlands, Hong Kong University of Science and Technology, Mannheim University in Germany, Norwegian School of Management in Norway, Groupe ESC Lyon in France, ESADE in Spain, and Helsinki School of Economics in Finland. Since the MBA program is continually exploring new international study opportunities, interested applicants should contact the program office (134 Bryan Hall) for additional exchange opportunities .

MASTER OF EDUCATION

The degree of Master of Education is a professional degree designed to meet the need for professional personnel to serve a variety of functions required in established and emerging educational activities of modern society. A thesis is not required.

A minimum of 36 credits is required in all master's programs with at least half of these credits in courses at the 5000 level or above. Twenty-one credits in education, with 15 at the graduate level, and 5 credits in courses outside education are included. There are two exceptions: (1) only 12 credits in education, all at the graduate level, are required for students having at least 21 credits in a baccalaureate program for teacher preparation, and (2) 15 credits in courses outside education are required for these same students if their master's programs are in English, foreign language, mathematics, science, and social studies education, or vocational, technical, and adult education.

At least 16 credits must be earned while the student is enrolled as a graduate student in courses offered on the Gainesville campus of the University of Florida, including registration for at least 6 credits in a single semester.

MASTER OF ENGINEERING

A student seeking a master's degree in the field of engineering may become a candidate for the Master of Engineering degree with or without thesis, provided such a candidate has a bachelor's degree in engineering from an ABET-accredited curriculum or has taken sufficient articulation course work to meet the minimum requirements specified by ABET. Students who do not meet this requirement may become candidates for the Master of Science degree, provided they meet departmental requirements for admission. The general intent in making this distinction is to encourage those who are professionally oriented to seek the Master of Engineering degree, and those who are more scientifically oriented and those who have science-based backgrounds to seek the Master of Science degree.

Also, the **Master of Civil Engineering** degree has been approved as a variant of the Master of Engineering degree. The M.C.E. is oriented specifically to the design and professional practice in civil engineering. The degree requirements include a minimum number of hours of design and professional practice instruction at the graduate level, six months' full-time civil engineering related experience or its equivalent obtained after the student has achieved junior status, and completion of the Engineer Intern Examination. The thesis or report required for all master's degrees must be design-related. Further details on this degree program may be obtained from the Chairman, Department of Civil Engineering.

Work Required.—The minimum course work required for the master's degree with thesis is 30 credits which may include up to 6 credits of research numbered 6971 in all departments. At least 12 credits, excluding 6971, must be in the student's major field of study. A minimum of 32 credits of course work is required, with at least 16 credits in the student's major field for the master's degrees without thesis. Environmental Engineering Sciences requires a minimum of 34 credits of course work for degrees without a thesis. At least 50% of the required credits must be in graduate level courses, excluding those graded as S/U. Courses in the major must be graduate level. If a minor is chosen, at least six credits of work are required: two six-credit minors may be taken. In addition, a multidisciplinary minor in departments other than the major may be authorized by the supervisory committee or program adviser. Courses numbered 3000 and above may be taken for the minor.

Degree Credit.—In order to qualify for course work toward the Master of Engineering degree, a student must first be admitted to the Graduate School at the University of Florida. The amount of course work toward this degree that may be taken at an off-campus center will depend upon the student's individual program and the courses provided through the center.

Examinations.—A student seeking the Master of Engineering degree with or without thesis is required to pass a comprehensive oral and/or written examination, administered on campus with all participants present, at the completion of the course work. An off-campus student who is a candidate for a nonthesis degree must take half the course work from full-time University of Florida faculty members and is required to pass a comprehensive written examination administered on the University of Florida campus by an examining committee recommended by the Dean of the College of Engineering and appointed by the Dean of the Graduate School. At least one member of the examining committee must be either the student's program adviser or a member of the supervisory committee. If a minor is taken, another member selected from the Graduate Studies Faculty must be chosen from outside the major department to represent the student's minor.

The requirement for an on-campus comprehensive written examination also applies to the nonthesis option of the Master of Science degree for students in the College of Engineering.

Examination requirements for the Master of Science degree are covered in the section *Master of Arts and Master of Science*.

A Certificate Program in Manufacturing Systems Engineering has been established as an option for the Master of Engineering degree of six departments: Aerospace Engineering, Mechanics, and Engineering Science; Computer and Information Sciences; Electrical Engineering; Industrial and Systems Engineering; Materials Science and Engineering; and Mechanical Engineering. Qualification for the certificate requires specified courses in manufacturing, 18 credits or more of course work selected from an approved manufacturing systems engineering core, completion of a master's thesis or project on a manufacturing-related topic, and satisfactory completion of departmental Master of Engineering requirements. In most cases, the manufacturing courses will partially satisfy required and elective course requirements stipulated by the home department.

MASTER OF FINE ARTS

The Master of Fine Arts degree is offered with majors in art, English (creative writing), and theatre. The requirements for this degree are the same as those for the Master of Arts with thesis except that a minimum of 60 credits (48 for English) is required, including 6 to 10 credits in 6971 (Research for Master's Thesis). Students in art and theatre may elect to substitute 6973 (Individual Project), creative work in lieu of the written thesis. Students intending to pursue this option should follow the general procedures below:

1. Using the college form, the student must obtain approval of a proposed project from the supervisory committee.

2. The student should include in the proposal a description of the nature of the project, the method and sources of research material, and how the project will be recorded—e.g., slides, tapes, scripts, program notes, etc.

3. Project must conform to departmental formats. To insure future accessibility and for record keeping purposes, a copy of the results must be deposited in a designated library.

Admission.—Applicants requesting admission to any of the programs should have an earned baccalaureate degree in the same or a closely related field from an accredited institution.

Students must fulfill the requirements of their discipline, as well as the Graduate School admission criteria. In cases where the undergraduate degree is not in the area chosen for graduate study, the student must demonstrate a level of achievement fully equivalent to the bachelor's degree in the graduate field concerned. A candidate found deficient in certain undergraduate areas will be required to remove the deficiences by successful completion of appropriate undergraduate courses.

In addition candidates in art or theatre are required to submit slides and/or a portfolio of the creative work, or to audition, prior to being accepted into the program. In English, the candidate must submit 2 short stories, 2 chapters of a novel, or 6 to 10 poems.

Three years of work in residence (two for English) are usually necessary to complete degree requirements. If deficiencies must be removed, the residency could be longer.

See additional information listed under the *Fields of Instruction* section of this *Catalog* for Art, English, and Theatre.

Art.—The MFA degree with a major in art is designed for those who wish to prepare themselves as teachers of art in colleges and universities and for those who wish to attain a professional level of proficiency in studio work. Specialization is offered in the studio areas of ceramics, creative photography, drawing, painting, printmaking, sculpture, graphic design, electronic intermedia, and multimedia. The MFA is generally accepted as the terminal degree in the studio area.

In addition to the general requirements above, students are required to take a minimum of 60 credit hours. Requirements include 42 hours in studio courses (24 in specialization, 12 in electives, and 6 in ART 6971 or 6973C); 6 hours in art history, 3 hours in seminar; 3 hours in aesthetics, criticism, or art law; and 6 hours of electives.

The College reserves the right to retain student work for purposes of record, exhibition, or instruction.

English.—The MFA in English with a concentration in creative writing helps talented men and women develop as writers and critics through a diverse selection of workshops and literary studies. Students work continually and closely with the writing faculty. Students are expected to produce a manuscript of publishable work at the end of the program.

The program includes nine courses (four workshops, three literature courses, and two electives), three reading tutorials, and a thesis: 48 credits in all. Students should plan to take one workshop each semester. Two of the literature courses must involve different centuries. One elective may be taken outside the department; electives may also be taken as independent study projects or additional literature courses. The thesis is an original manuscript of fiction or poetry.

Theatre.—The MFA degree with a major in theatre is designed primarily for those interested in production-oriented theatrical careers and teaching. Specialization is offered in the areas of performance and design/technology. The craft skills encompassed in the program are given subsequent application in public and studio productions.

Course work includes 18 hours of core classes, 17 hours of specialty training, an internship, and a project in lieu of thesis. The program totals 60 hours.

MASTER OF FOREST RESOURCES AND CONSERVATION

The Master of Forest Resources and Conservation program is designed for those students who wish additional professional preparation, rather than for those interested primarily in research. This nonthesis degree is offered in the same specializations as the Master of Science degree. The basic requirements, including those for admission, supervisory committee, and plan of study, are the same as those indicated under *General Regulations* for master's degrees in this *Catalog*.

Work Required.—A minimum of 32 credits of course work is required with at least 16 credits in graduate level courses. A minimum of 12 credits must be in a selected area of specialization in graduate level courses. A thesis is not required, but the student must submit a technical paper in an appropriate field. A comprehensive written qualifying examination, given by the supervisory committee, is required one semester prior to graduation. A final oral examination, covering the candidate's entire field of study, is required. Both examinations must be given on campus.

MASTER OF HEALTH SCIENCE

The Master of Health Science degree is designed to meet the need for leadership personnel in allied health to serve a variety of functions required in established and emerging health care programs. There are graduate programs in health and hospital administration, occupational therapy, physical therapy, and rehabilitation counseling. The health and hospital administration program is available *only* as part of a joint MBA/MHS degree program offered in cooperation with the College of Business Administration.

The graduate program in health and hospital administration is designed to train qualified individuals for positions of leadership in health services organizations and the communities which they serve. The program requires full-time study for five semesters plus an administrative residency experience of 6 to 12 months. Students are admitted only in the fall semester and must be simultaneously admitted to the Master of Business Administration program by the College of Business Administration. A total of 66 semester hours of academic credit is required.

In occupational therapy, applicants must have completed an accredited entry-level occupational therapy program. The master's program includes satisfactory completion of a minimum of 36 credits of academic course work. This nonthesis degree requires the candidate to complete an approved research project and pass an oral examination as part of the degree requirements. This one-year program is designed to prepare occupational therapists for leadership roles in clinical practice, administration, or education.

In physical therapy the program requires satisfactory completion of 32 semester credits which include a core curriculum. These courses involve concepts of health care and management, research design, research instrumentation, and physical therapy theory, assessment, and treatment. Elective course work and a research project are required components of the curriculum. A clinical internship with a recognized clinician is optional. The course work applied toward the degree must include at least 24 credits of letter-graded courses. The maximum number of research credits that can be applied toward the degree is six. All candidates must pass an oral examination. The nonthesis curriculum is designed with flexibility to permit each student to pursue and develop his or her expertise.

The rehabilitation counseling program is designed to meet the need for professional personnel to serve in a variety of rehabilitation counseling areas. The department requires a minimum of 52 academic credits for the majority of students including a minimum of 37 credits in the major area. Some exceptionally well-qualified students may be required to take a minimum of 43 credits including a minimum of 31 credits in the major area. Work in the major area includes three semesters of practicum experiences and a full-time internship. Elective courses may be selected which complement the major courses and relate to the career plans of the student. All candidates must pass a comprehensive examination.

Additional requirements are listed under the General Regulations section for all master's degrees.

MASTER OF HEALTH SCIENCE EDUCATION

The program leading to the degree of Master of Health Science Education is designed to meet the need for advanced preparation of health educators to serve in positions of leadership in community, business, health care delivery, and community college and school settings.

Work Required.—A minimum of 36 credits of course work is required, of which at least 50% must be graduate courses in health science education. Course approval must be obtained from the student's academic adviser.

Supervisory Committee.—A committee of at least two members, including a chairperson and at least one other member from the department graduate faculty, will supervise the work of students registered in this program.

Final Examination.—The candidate must pass a final written examination covering the course of student and research knowledge. The examination is taken in the semester in which the candidate plans to complete the degree.

MASTER OF LANDSCAPE ARCHITECTURE

The degree of Master of Landscape Architecture is the advanced professional degree for graduates with baccalaureate credentials in landscape architecture and is a first professional degree for the graduate from a nonlandscape architectural background. Candidates are admitted from related and unrelated fields and backgrounds. An advanced professional life experience base is available for eligible candidates.

Work Required.—For landscape architecture and related or nonrelated degree bases, candidates must complete a minimum of 52 credit hours, including no more than 6 credit hours of thesis or project. Required preparatory courses are in addition to the minimum credits for graduate work. For advanced professional life experience candidates, the minimum requirement is 30 credit hours, including thesis. At least 50% of all course work must be graduate courses in landscape architecture. For some study areas, with permission from the departmental graduate faculty, a terminal project requiring six credits may be elected in lieu of a thesis.

MASTER OF LAWS IN TAXATION (LL.M. IN TAX.)

The instructional program leading to the degree Master of Laws in Taxation offers advanced instruction in taxation, with emphasis on federal taxation and particularly federal income taxation, for law graduates who plan to specialize in such matters in the practice of law.

Work Required.—Degree candidates must complete 24 credit hours, 22 of which must be in graduate level tax courses, including a research and writing course.

MASTER OF MUSIC

The Master of Music degree is offered with programs in music and music education. The music program includes the following areas of emphasis: performance, theory, composition, history and literature, sacred music, organ pedagogy, piano pedagogy, voice pedagogy, string pedagogy, string development, accompanying, choral conducting, and instrumental conducting. The Master of Music is designed for those who wish to prepare for careers as teachers in studios, schools, and universities; performers; music historians; music critics; church musicians; composers; conductors; and accompanists.

Admission.—Applicants should have a baccalaureate degree in music or a closely related area from an accredited institution and must meet the admission requirements of the Graduate School and the College of Fine Arts. In cases where the undergraduate degree is not in the area chosen for graduate study, the student must demonstrate a level of achievement fully acceptable for master's level work. In no case will an applicant be accepted with less than 16 semester credits in music theory, 6 semester credits in music history, and 12 semester credits in performance. A candidate found deficient in certain undergraduate areas will be required to remove the deficiencies by successful completion of appropriate courses. If remedial work is required, the residency—usually two to three semesters of full-time study—may be longer. An audition is required for all students.

Work Required.—A minimum of 32 credits of course work is required, exclusive of prerequisite or deficiency courses, including a core of 9 credits. The core in all emphases includes MUS 6716 (MUE 6785 in the music education program), MUT 6629, and one graduate course in the MUH or MUL category. A thesis or creative project in lieu of a written thesis is required.

The College of Fine Arts reserves the right to retain student work for purposes of record, exhibition, or instruction.

Additional information is given in the *Fields of Instruction* section.

MASTER OF SCIENCE IN ARCHITECTURAL STUDIES

Admission.—The Master of Science in Architectural Studies is a nonprofessional, research degree for students with undergraduate degrees in any field of study who wish to undertake advanced studies and research in architectural

specialties. Areas of specialization include environmental technology, architectural preservation, design, urban design, history, and theory.

Work Required.—A minimum of 35 credits of course work is required, including up to 6 hours of ARC 6971 (Research for Master's Thesis). While a majority of the course work should be within the Department of Architecture, multidisciplinary electives in planning, history, law, engineering, art history, and real estate are encouraged. It is also anticipated that students will enroll in one or more of the Department's off-campus programs, in Nantucket, in the Caribbean, or in Italy. A thesis is required.

The requirements for level and distribution of credits, supervisory committee, and final examination are the same as stated for the *Master of Arts* and *Master of Science* with thesis in the front of this *Catalog*.

MASTER OF SCIENCE IN EXERCISE AND SPORT SCIENCES AND MASTER OF EXERCISE AND SPORT SCIENCES

The Department of Exercise and Sport Sciences offers the Master of Science in Exercise and Sport Sciences and the Master of Exercise and Sport Sciences degrees with specializations in teaching, sport administration, exercise physiology, athletic training, motor behavior (consisting of two tracks—motor learning/control and sport psychology), special physical education, and wellness. Candidates for the Master of Science in Exercise and Sport Sciences (MSESS) must (1) complete a minimum of 30 semester hours including 24 credits of course work and no more than 6 thesis credits, (2) develop a program of study and research that is congruent with his/her professional goals and that has the approval of a three member supervisory committee composed of two graduate faculty members from within the department and one from either the major department or an outside department, and (3) prepare and orally defend a written thesis.

Requirements for the Master of Exercise and Sport Sciences (MESS) degree include (1) completing a minimum of 34 credits in approved course work, (2) working with a three member supervisory committee from the department's graduate faculty to develop an individualized program designed to facilitate professional goals, and (3) passing written and oral comprehensive examinations in the area of specialization and concomitant areas of study. All work must be approved by the chairperson of the supervisory committee. If knowledge deficiencies are identified, additional course work may be required.

MASTER OF SCIENCE IN NURSING AND MASTER OF NURSING

The College of Nursing offers the Master of Science in Nursing and Master of Nursing degrees with specializations in adult health, child health, critical care, community health, family nurse practitioner, geriatric nurse practioner, neonatal nursing, nurse midwifery, nursing administration, oncology nurse specialist, pediatric nurse practitioner, psychiatric and mental health, and women's and infants' nursing. Preparation for roles of clinical specialist, nurse educator, nursing administrator, and nurse practitioner is offered.

Work Required.—A minimum of 48 semester hours is required for graduation. Candidates for the Master of Science in Nursing degree must prepare and present theses acceptable to their supervisory committees and the Graduate School. These theses will be published by microfilm. Candidates for the Master of Nursing degree are required to complete a project acceptable to the College.

Final Examination.—During the final semester each student in the Master of Science in Nursing program must pass an oral examination in defense of the thesis. A final comprehensive oral or written examination must be passed by candidates for the Master of Nursing degree. These examinations must be taken on campus.

MASTER OF STATISTICS

The minimum credits required for the Master of Statistics degree are 36, including no fewer than 20 graduate credits in the major field. Courses in the degree program will be selected in consultation with the major adviser and approved by the student's supervisory committee. The student will be required to pass two examinations: (1) a comprehensive written examination, given by a committee designated for the purpose, on material covered in statistics courses for first year graduate students and (2) a final oral examination given by the student's supervisory committee, covering the entire field of study. Both examinations must be taken on campus.

REQUIREMENTS FOR THE DEGREE OF ENGINEER

For those engineers who need additional technical depth and diversification in their education beyond the master's degree, the College of Engineering offers the degree of Engineer.

This degree requires a minimum of 30 credit hours of graduate work beyond the master's degree. It is not to be considered as a partial requirement toward the Ph.D. degree. The student's objective after the master's degree should be the Ph.D. **or** the Engineer degree.

Admission to the Program.—To be admitted to the program, students must have completed a master's degree in engineering and apply for admission to the Graduate School of the University of Florida. The master's degree is regarded as the foundation for the degree of Engineer. The master's degree must be based on the candidate having a bachelor's degree in engineering from an ABET-accredited curriculum or having taken sufficient articulation course work to meet the minimum requirements specified by ABET.

Course and Residence Requirements.—A total registration in an approved program of at least 30 semester credit hours beyond the master's degree is required. This mini-

mum requirement must be earned through the University of Florida. The last 30 semester credit hours must be completed within five calendar years.

Supervisory Committee.—Each student admitted to the program will be advised by a supervisory committee consisting of at least three members of the graduate faculty. Two members are selected from the major department and at least one from a supporting department. In addition, every effort should be made to have a representative from industry as an external adviser for the student's program.

This committee should be appointed as soon as possible after the student has been admitted to the Graduate School but, in no case, later than the end of the second semester of study.

This committee will inform the student of all regulations pertaining to the degree program. The committee is nominated by the department chairperson, approved by the Dean of the College of Engineering, and appointed by the Dean of the Graduate School. The Dean of the Graduate School is an ex-officio member of all supervisory committees and should be notified in writing in advance of all committee meetings. If a thesis or report is a requirement in the plan of study, the committee will approve the proposed thesis or report and the plans for carrying it out. The thesis must be submitted to the Graduate School. The committee will also conduct the final examination on campus when the plan of study is completed.

Plan of Study.—Each plan of study is developed on an individual basis for each student. Thus, there are no specific requirements for the major or minor; each student is considered as a separate case. If the plan of study includes a thesis, the student may register for from 6 to 12 semester credit hours of thesis research in a course numbered 6972.

Thesis.—The thesis should represent performance at a level above that ordinarily associated with the master's degree. It should clearly be an original contribution; this may take the form of scientific research, a design project, or an industrial project approved by the supervisory committee. Work on the thesis may be conducted in an industrial or governmental laboratory under conditions stipulated by the supervisory committee.

Final Examination.—After the student has completed all work on the plan of study, the supervisory committee conducts a final comprehensive oral and/or written examination, which also involves a defense of the thesis if one is included in the program. This examination must be taken on campus with all participants present.

REQUIREMENTS FOR THE ED.S. AND ED.D.

The College of Education offers programs leading to the degrees Specialist in Education, Doctor of Education, and Doctor of Philosophy.

The Specialist in Education degree is awarded for a two-year program of graduate study. The Doctor of Education degree requires writing a doctoral dissertation. Foreign languages are not required. The Doctor of Philosophy degree in the College of Education is described under *Requirements for the Ph.D.*

In cooperation with the Graduate Studies Office, College of Education, programs leading to these degrees are administered through the individual departments in the College of Education. It is the responsibility of the department's chairperson to carry out the policies of the Graduate School and the graduate committee of the College of Education. More specific information about the various programs and departmental requirements may be obtained from the individual departments. General information or assistance is available through the Office of Student Services in Education, 134 Norman Hall.

Admission to the Ed.S., Ed.D., and Ph.D. programs is open only to persons who have met the following requirements:

1. Achieved at least the minimum upper-division undergraduate grade average and verbal-quantitative total score on the General Test of the Graduate Record Examination necessary for admission to the Graduate School, University of Florida.

2. Provided evidence of good scholarship for previous graduate work (a 3.5 grade-point average or above, as computed by the University of Florida, will be considered satisfactory).

3. Successfully completed 36 credits of professional course work in education. Applicants for admission to advanced degree programs in the College of Education who meet all the requirements except for successfully completing 36 credits of professional education courses may be given provisional admission and full admission when they have completed the required 36 credits.

4. Presented a record of successful professional experience, the appropriateness of which will be determined by the instructional department passing on the applicant's qualifications for admission. In some instances, departments may admit students with the understanding that further experience may be required before the student will be recommended for the degree.

The judgment about admission of an individual is made by the major department, the College of Education, and the Graduate School, University of Florida.

SPECIALIST IN EDUCATION

Primary emphasis in an Ed.S. program is placed on the development of the competencies needed for a specific job. Programs are available in the various areas of concentration within the Departments of Counselor Education, Educational Leadership, Foundations of Education, Instruction and Curriculum, and Special Education.

To study for this degree, the student must apply and be admitted to the Graduate School of the University of Florida. All work for the degree, including transferred credit, must be completed during the seven years immediately preceding the date on which the degree is awarded.

The Ed.S. degree is awarded at the completion of a planned program with a minimum of 72 credits beyond the bachelor's degree or a minimum of 36 credits beyond the master's degree. All credits accepted for the program must contribute to the unity and the stated objective of the total program. Students are tested (in no case earlier than six months prior to receipt of degree) in both a written and an oral examination, given on campus by a committee selected by the department chairperson. A thesis is not required; however, each program will include continuing attention to a research component relevant to the professional role for which the student is preparing.

Students who enter the program with an appropriate master's degree from another accredited institution must complete a minimum of 36 credits of post-master's study to

satisfy the following requirements.

1. Twenty-one credits in graduate level courses.

2. At least 12 credits in graduate level professional education courses.

3. Registration on the Gainesville campus of the University of Florida for at least six credits in a single semester.

Twelve credits for appropriate courses offered off-campus by the University of Florida may be transferred to the program. Six credits may be transferred from another institution of the State University System or from any institution offering a doctoral degree; however, credit transferred from another institution reduces proportionately the credit transferred from University of Florida off-campus courses.

Students who enter the program with a bachelor's degree only must, during the 72-credit program, satisfy these requirements in addition to the requirements of the Master of Education degree or its equivalent.

DOCTOR OF EDUCATION

A doctoral candidate is expected to achieve understanding of the broad field of education and competence in an area of specialization. Programs are available in the various areas of concentration within the Departments of Counselor Education, Educational Leadership, Foundations of Education, Instruction and Curriculum, and Special Education.

Admission to a program of work leading to the degree of Doctor of Education requires admission to the Graduate School.

A minimum of 90 credits beyond the bachelor's degree is required for the doctoral degree. Master's degrees outside the major require departmental petition to the Dean of the Graduate School. All master's degrees counted in the 90-hour minimum must have been earned within the last seven years. No more than 30 hours of a master's degree from another institution will be transferred to a doctoral program. All courses beyond the master's degree taken at another institution, to be applied toward the Doctor of Education degree, must be taken at an institution offering the doctoral degree and must be approved for graduate credit by the Graduate School of the University of Florida.

Minors.—Minor work or work in cognate fields is required. Minor work may be completed in any department, other than the major department, approved for master's or doctoral degree programs as listed in the *Catalog*. If one minor is selected, at least 15 credits of work therein will be required; if two minors are chosen, one minor must include at least 12 credits of course work, the other at least 5 credits. At least 12 credits counted in a minor must be at the 5000 level or higher.

Courses in physical education approved by the College of Health and Human Performance and the Graduate School as subject matter or content courses may be used in the cognate work or as a minor.

In lieu of a minor or minors, the candidate may present a suitable program of no fewer than 15 credits of cognate work in at least two departments. If two fields are included, there shall be no fewer than five credits in each field. If three or more fields are included, the five credit requirement for each field does not apply. This program must have the approval of the student's supervisory committee. The College of Education faculty will expect the candidate to be prepared to answer questions, at the time of the oral examination, in any of the areas chosen.

Admission to Candidacy.—Admission to candidacy for the degree of Doctor of Education requires successful completion of the qualifying examinations and approval of a dissertation topic. Recommendation to the Graduate School for admission to candidacy is based on the action of the supervisory committee. Application for admission to candidacy should be made as soon as the qualifying examination has been passed and a dissertation topic has been approved by the student's supervisory committee.

Qualifying Examination.—The applicant is recommended for the qualifying examination by the supervisory committee after completion of sufficient course work.

The examination, administered on campus by the student's major department, consists of (1) a general section, (2) a field of specialization section, (3) examination in the minor or minors, where involved, and (4) an oral examination conducted by the applicant's supervisory committee.

At least five faculty must be present for the oral portion of the examination; however, only members of the supervisory committee are required to sign the Admission to Candidacy form.

If the student fails the qualifying examination, a re-examination will not be given unless recommended for special reasons by the supervisory committee and approved by the Graduate School. At least one semester of additional preparation is considered essential before re-examination.

Research Preparation Requirement.—EDF 7486 (Methods of Educational Research) or its equivalent, for which a basic course in statistics is a prerequisite, and one other approved course are minimum requirements in all programs. Additional requirements vary with the department and with the student's plans for doctoral research.

For information relating to *Concentrated Period of Study*, the *Supervisory Committee*, *Time Lapse*, the *Dissertation*, and the *Final Examination*, the student is referred to the material presented under the heading *Requirements for the Ph.D.* These statements are applicable to both degrees.

REQUIREMENTS FOR THE PH.D.

Doctoral study consists of the independent mastery of a field of knowledge and the successful pursuit of research. Consequently, doctoral programs are more flexible and varied than those leading to other graduate degrees. The Graduate Council does not specify what courses will be required for the Ph.D. degree. The general requirement is that the program should be unified in relation to a clear objective, that it should have the considered approval of the student's entire supervisory committee, and that it should include an appropriate number of credit hours of doctoral research.

COURSE REQUIREMENTS

The course requirements for doctoral degrees vary from field to field and from student to student. If a student holds a master's degree in a discipline different from the doctoral program, the master's work will not be counted in the program unless the department petitions the Dean of the Graduate School. All master's degrees counted in the 90-hour minimum must have been earned in the last seven

years. No more than 30 hours of a master's degree from another institution will be transferred to a doctoral program. All courses beyond the master's degree taken at another university, to be applied to the Ph.D. degree, must be taken at an institution offering the doctoral degree and must be approved for graduate credit by the Graduate School of the University of Florida. The student's supervisory committee has the responsibility for recommending individual courses of study for each doctoral student.

Major.—The student working for the Ph.D. must elect to do the major work in a department or interdisciplinary unit specifically approved for the offering of doctoral courses and the supervision of dissertations. These departments are listed under *Graduate Programs.*

Minor.—With the approval of the supervisory committee, the student may choose one or more minor fields. Minor work may be completed in any department, other than the major department, approved for master's or doctoral degree programs as listed in this *Catalog.* The collective grade for courses included in a minor must be B or higher.

If one minor is chosen, the representative of the minor department on the supervisory committee shall suggest from 12 to 24 credits (at least 12 credits must be at the 5000 level or higher) as preparation for a qualifying examination. A part of this background may have been acquired in the master's program. If two minors are chosen, each must include at least eight credits. Competence in the minor area may be demonstrated through a written examination conducted by the minor department or through the oral qualifying examination.

Course work in the minor at the doctoral level need not be restricted to the courses of one department, provided that the minor has a clearly stated objective and that the combination of courses representing the minor shall be approved by the Graduate School. This procedure is not required for a departmental minor.

LEAVE OF ABSENCE

A doctoral student who will not be registered at the University of Florida for a period of more than one semester must request written permission from his/her faculty adviser for a leave of absence for a designated period of time.

SUPERVISORY COMMITTEE

Supervisory committees are nominated by the department chairperson, approved by the dean of the college concerned, and appointed by the Dean of the Graduate School. The committee should be appointed as soon as possible after the student has begun doctoral work and in general no later than the end of the second semester of equivalent full-time study. The Dean of the Graduate School is an ex-officio member of all supervisory committees and should be notified in writing well in advance of all examinations conducted by such committees.

Duties and Responsibilities.—Duties of the supervisory committee follow:

1. To inform the student of all regulations governing the degree sought. **It should be noted, however, that this does not absolve the student from the responsibility of informing himself/herself concerning these regulations.** *(See **Student Responsibility.**)*

2. To meet immediately after appointment to review the qualifications of the student and to discuss and approve a program of study.

3. To meet to discuss and approve the proposed dissertation project and the plans for carrying it out.

4. To give the student a yearly letter of evaluation in addition to the S/U grades awarded for the research courses 7979 and 7980. The chair should write this letter after consultation with the supervisory committee.

5. To conduct the qualifying examination or, in those cases where the examination is administered by the department, to take part in it. In either event, no fewer than five faculty members shall be present with the student for the oral portion of the examination. This examination must be given on campus.

6. To meet when the work on the dissertation is at least one-half completed to review procedure, progress, and expected results and to make suggestions for completion.

7. To meet on campus when the dissertation is completed and conduct the final oral examination to assure that the dissertation is a piece of original research and a contribution to knowledge. No fewer than five faculty members, including all members of the supervisory committee, plus the graduate dean's representative, shall be present with the candidate for this examination. Only members of the official supervisory committee may sign the dissertation. The dissertation must be approved unanimously by the official supervisory committee.

Membership.—The supervisory committee for a candidate for the doctoral degree shall consist of no fewer than four members selected from the graduate faculty. At least two members, including the chairperson, will be from the department recommending the degree, and at least one member will be drawn from a different educational discipline. The chairperson and at least one additional member of the committee must be members of the Doctoral Research Faculty of the University of Florida.

If a minor is chosen, the supervisory committee will include at least one person selected from the graduate faculty from outside the discipline of the major for the purpose of representing the student's minor. In the event that the student elects more than one minor, each minor area must be represented on the supervisory committee.

The Graduate Council desires each supervisory committee to function as a University committee, as contrasted with a departmental committee, in order to bring University-wide standards to bear upon the various doctoral degrees.

A cochairperson may be appointed to serve during a planned absence of the chairperson.

LANGUAGE REQUIREMENT

Any foreign language requirement, or a substitute therefor, for the Ph.D. is established by the major department with approval of the college. The student should check with the graduate coordinator of the appropriate department for specific information. The foreign language departments offer special classes for graduate students who are beginning the study of a language. See the current *Schedule of Courses* for the languages in which this assistance is available.

The ability to use the English language correctly and effectively, as judged by the supervisory committee, is required of all candidates.

PERIOD OF CONCENTRATED STUDY

Candidates for the doctoral degree must satisfy the minimum requirements for a period of concentrated study, beyond the first 30 hours counted toward the doctoral program, by registering for (1) 30 semester hours in one calendar year, or (2) 32 semester hours in no more than four semesters within a period of two calendar years on the University of Florida campus. Courses at the 1000 or 2000 level will not be counted toward the requirement for concentrated study.

Candidates in the College of Agriculture may do their research at certain branch stations of the University of Florida Agricultural Experiment Station where adequate faculty and facilities are available.

QUALIFYING EXAMINATION

The qualifying examination, which is required of all candidates for the degree of Doctor of Philosophy, may be taken during the third semester of graduate study beyond the bachelor's degree.

The student must be registered in the term in which the qualifying examination is given.

The examination, prepared and evaluated by the full supervisory committee or the major and minor departments, is both written and oral and covers the major and minor subjects. At least five faculty members, including the supervisory committee, must be present with the student at the oral portion. The supervisory committee has the responsibility at this time of deciding whether the student is qualified to continue work toward a Ph.D. degree.

If a student fails the qualifying examination, the Graduate School must be notified. A re-examination may be requested, but it must be recommended by the supervisory committee and approved by the Graduate School. At least one semester of additional preparation is considered essential before re-examination.

Time Lapse.—Between the oral portion of the qualifying examination and the date of the degree there must be a minimum of two semesters. The semester in which the qualifying examination is passed is counted, provided that the examination occurs before the midpoint of the term.

ADMISSION TO CANDIDACY

A graduate student does not become a candidate for the Ph.D. degree until granted formal admission to candidacy. Such admission requires the approval of the student's supervisory committee, the department chairperson, the college dean, and the Dean of the Graduate School. The approval must be based on (1) the academic record of the student, (2) the opinion of the supervisory committee concerning overall fitness for candidacy, (3) an approved dissertation topic, and (4) a qualifying examination as described above. **Application for admission to candidacy should be made as soon as the qualifying examination has been passed and a dissertation topic has been approved by the student's supervisory committee.** A student may register for 7980 (Research for Dissertation) in the term he or she is admitted to candidacy for a doctoral degree.

DISSERTATION

Every candidate for a doctoral degree is required to prepare and present a dissertation that shows independent investigation and is acceptable in form and content to the supervisory committee and to the Graduate School. Dissertations must be written in English. The Dean of the Graduate School may approve exceptions to this rule on an individual basis for students majoring in German or Romance languages and literatures.

Since all doctoral dissertations will be published by microfilm, it is necessary that the work be of publishable quality and that it be in a form suitable for publication.

The original copy of the dissertation must be presented to the Dean of the Graduate School on or before the date specified in the *University Calendar*. It must contain an abstract and be accompanied by four unpaged separate copies of the abstract, a letter of transmittal from the supervisory chairperson, and all doctoral forms. After corrections have been made, and no later than the specified formal submission date, the fully signed copy of the dissertation, together with the signed Final Examination Report, should be returned to the Graduate School. The original copy of the dissertation is sent by the Graduate School to the Library for microfilming and hardbinding. A second copy, reproduced on required thesis paper, should be delivered to the Library for hardbinding. The supervisory chairperson and the candidate will each need a copy and, if required, another should also be provided for the departmental library.

Publication of Dissertation.—All candidates for the Ph.D. and Ed.D. degrees are required to pay the sum of $50 to University Financial Services, S113 Criser Hall, for microfilming their dissertations, and to sign an agreement authorizing publication by microfilm.

Copyright.—The candidate may choose to copyright the microfilmed dissertation for a charge of $35 payable by a certified or cashier's check or money order to University Microfilms attached to the signed microfilm agreement form. To assure receipt of the valuable Copyright Registration Certificate, candidates must give permanent addresses through which they can always be reached.

GUIDELINES FOR RESTRICTION ON RELEASE OF DISSERTATIONS

Research performed at the University can effectively contribute to the education of our students and to the body of knowledge that is our heritage only if the results of the research are published freely and openly. Conflicts can develop when it is in the interests of sponsors of university research to restrict such publication. When such conflicts arise, the University must decide what compromises it is willing to accept, taking into account the relevant circumstances. The AAU guidelines contained herein were adopted by the University of Florida Graduate Council on January 19, 1989.

1. The recommendations of sponsors, which result from prepublication reviews of research results and which affect subsequent publication of these results, should be considered advisory rather than mandatory.
2. The maximum delay in publication allowed for prereviews should not exceed three months.
3. There should be no additional delays in publication

beyond the pre-review. Timely submission of any patent or copyright applications should be the result of effective communication between investigators and sponsors throughout the course of the project.

4. There should be no restriction on participation in nonclassified sponsored research programs on the basis of citizenship.

5. Students should not be delayed in the final defense of their dissertations by agreements involving publication delays.

FINAL EXAMINATION

After submission of the dissertation and the completion of all other prescribed work for the degree, but no earlier than the term preceding the semester in which the degree is conferred, the candidate will be given a final examination, oral or written or both, by the supervisory committee meeting on campus. An announcement of the scheduled examination and an abstract must be sent to the Dean of the Graduate School 10 working days before the selected date. At least five faculty members, including all supervisory committee members, must be present with the candidate at the oral portion of this examination. The Dean of the Graduate School may be represented by a member of the Doctoral Research Faculty. At the time of the defense all committee members should sign the signature pages and all committee and attending faculty members should sign the Final Examination Report. These may be retained by the supervisory chairman until acceptable completion of corrections.

Satisfactory performance on this examination and adherence to all Graduate School regulations outlined above complete the requirements for the degree.

Time Limitation.—All work for the doctorate must be completed within five calendar years after the qualifying examination, or this examination must be repeated.

CERTIFICATION

Doctoral candidates who have completed all requirements for the degree, including satisfactory defense and final acceptance of the dissertation, may request certification to that effect prior to receipt of the degree. Certification request forms, available in the Graduate School Editorial Office, should be filled out by the candidate, signed by the college dean, and returned to the Graduate School for verification and processing.

RESIDENCY

CLASSIFICATION OF STUDENTS— FLORIDA OR NON-FLORIDA

(Section 6C-7.005 Florida Administrative Code.)

(1) For the purpose of assessing registration and tuition fees, a student shall be classified as a resident or a nonresident. A "resident for tuition purposes" is a person who qualifies for the in-state tuition rate; a "nonresident for tuition purposes" is a person who does not qualify for the in-state tuition rate.

(a) To be classified as a "resident for tuition purposes," a person, or, if a dependent child, the child's parent or parents or legal guardian, shall have established legal residence in Florida and shall have maintained physical presence in Florida for at least twelve (12) months immediately prior to the first day of classes of the term for which Florida residency is sought. A dependent child is a person who may be claimed by his or her parent or guardian as a dependent under the Federal Income Tax Code. Every applicant for admission to a university shall be required to make a statement as to the length of residence in the state and, shall also establish his or her presence, or, if a dependent child, the presence of his or her parent or parents, in the state for the purpose of maintaining a bona fide domicile in accordance with the provisions of Section 240.1201(2)(b), Florida Statutes.

(b) With respect to a dependent child, the legal residence of such individual's parent or guardian shall be prima facie evidence of the individual's legal residence in accordance with the provisions of Section 240.1201(4), Florida Statutes. Prima facie evidence may be reinforced or rebutted by evidence of residency, age, and the general circumstances of the individual in accordance with the provisions of Rule 6C-7.005(2).

(c) In making domiciliary determinations related to the classification of persons as residents or nonresidents for tuition purposes, the domicile of a married person, irrespective of sex, shall be determined in accordance with the provisions of Section 240.1201(5), Florida Statutes.

(d) Any nonresident person, irrespective of sex, who marries a legal resident of this state or marries a person who later becomes a legal resident, may, upon becoming a legal resident of this state, accede to the benefit of the spouse's immediately precedent duration as a legal resident for purposes of satisfying the 12-month durational requirement.

(e) No person shall lose his or her resident status for tuition purposes solely by reason of serving, or, if a dependent child, by reason of the parent or parents serving, in the Armed Forces outside this state.

(f) A person who has been properly classified as a resident for tuition purposes, but who, while enrolled in an institution of higher education in this state, loses resident tuition status because the person, or, if a dependent child, the parent or parents, establishes domicile or legal residence elsewhere, shall continue to enjoy the resident tuition rate for a statutory grace period. This grace period shall be measured in accordance with the provisions of Section 240.1201(8), Florida Statutes.

(g) The legal residence of a dependent child whose parents are divorced, separated, or otherwise living apart shall be deemed to be Florida if either parent is a legal resident of Florida, regardless of which parent is entitled to claim, and does in fact claim, the minor as a dependent pursuant to federal individual income tax provisions.

(h) Any person who ceases to be enrolled at or graduates from an institution of higher education while classified as a resident for tuition purposes and who subsequently abandons Florida domicile shall be permitted to reenroll at an institution of higher education in this state as a resident for tuition purposes in accordance with the provisions of Section 240.1201(10), Florida Statutes.

(i) A member of the Armed Forces on active duty stationed in Florida, and the spouse and dependents of such member, shall be classified as residents for tuition purposes.

(j) Full-time instructional and administrative personnel employed by state public schools, community colleges,

and institutions of higher education, and the spouses and dependent children of such individuals, shall be classified as residents for tuition purposes.

(k) A student enrolled through the Florida Linkage Institutes program shall be assessed resident tuition for the credit hours approved by the applicable Linkage Institute and non-resident tuition for all other credit hours.

(l) A full-time student from Latin America or the Caribbean who receives a scholarship from the federal or state government shall be classified as a resident for tuition purposes.

(m) Southern Regional Education Board's Academic Common Market graduate students shall be classified as residents for tution purposes.

(n) A full-time employee of a state agency or political subdivision of the state shall be classified as a resident for tuition purposes when the student's tuition is paid by the state agency or political subdivision for the purpose of job-related law enforcement or corrections training.

(o) United States citizens, their spouses, and dependent children living on the Isthmus of Panama, who have completed 12 consecutive months of college work at the Florida State University Panama Canal Branch shall be classified as residents for tuition purposes.

(p) McKnight Doctoral Fellows who are United States citizens shall be classified as residents for tuition purposes.

(2) An individual shall not be classified as a resident for tuition purposes and, thus, shall not be eligible to receive the resident tuition rate, until the individual has provided satisfactory evidence as to his or her legal residency and domicile to appropriate university officials. In determining residence, the university shall require evidence such as a voter registration, driver's license, automobile registration, location of bank account, rent receipts or any other relevant materials as evidence that the applicant has maintained 12 months' residence immediately prior to qualification. To determine if the student is a dependent child, the university shall require evidence such as copies of the aforementioned documents. In addition, the university may require a notarized copy of the parent's IRS return. If a nonresident wishes to qualify for resident tuition status in accordance with Section (1)(d) above, the applicant must present evidence of the spouse's legal residence with certified copies of the aforementioned documents. "Resident student" classification shall also be construed to include students to whom an Immigration Parolee card or a Form I-94 (Parole Edition) was issued at least one year prior to the first day of classes for which resident student status is sought, or who have had their resident alien status approved by the United States Immigration and Naturalization Service, or who hold an Immigration and Naturalization Form I-151, I-551 or a notice of an approved adjustment of status application, or Cuban Nationals or Vietnamese Refugees or other refugees or asylees so designated by the United States Immigration and Naturalization Service who are considered as Resident Aliens, or other legal aliens, provided such students meet the residency requirements stated above and comply with subsection (4) below. The burden of establishing facts which justify classification of a student as a resident and domiciliary entitled to "resident for tuition purposes" registration rates is on the applicant for such classification.

(3) In applying this policy,

(a) "Student" shall mean a person admitted to the institution, or a person allowed to register at the institution on a space available basis.

(b) "Domicile" shall denote a person's true, fixed, and permanent home, and to which whenever the person is absent the person has the intention of returning.

(c) "Parent" shall mean an individual's father or mother, or if there is a court appointed guardian or legal custodian of the individual, other than the father or mother, it shall mean the guardian or legal custodian.

(d) The term "dependent child" as used in this rule, is the same as a dependent as defined in the Internal Revenue Code of 1954.

(4) In all applications for admission or registration at the institution on a space available basis a "resident for tuition purposes" applicant, or, if a dependent child, the parent of the applicant, shall make and file with such application a written statement that the applicant is a bona fide resident and domiciliary of the State of Florida, entitled as such to classification as a "resident for tuition purposes" under the terms and conditions prescribed for residents and domiciliaries of the state of Florida. All claims to "resident for tuition purposes" classification must be supported by evidence as stated in Rule 6C- 7.005(1), (2) if requested by the registering authority.

(5) A "nonresident" or, if a dependent child, the individual's parent, after maintaining a legal residence and being a bona fide domiciliary of Florida for twelve (12) months, immediately prior to enrollment and qualification as a resident, rather than for the purpose of maintaining a mere temporary residence or abode incident to enrollment in an institution of higher education, may apply for and be granted classification as a "resident for tuition purposes"; provided, however, that those students who are nonresident aliens or who are in the United States on a nonimmigration visa will not be entitled to reclassification. An application for reclassification as a "resident for tuition purposes" shall comply with provisions of subsection (4) above. An applicant who has been classified as a "nonresident for tuition purposes" at time of original enrollment shall furnish evidence as stated in 6C-7.005(1) to the satisfaction of the registering authority that the applicant has maintained residency in the state for the twelve months immediately prior to qualification required to establish residence for tuition purposes. In the absence of such evidence, the applicant shall not be reclassified as a "resident for tuition purposes." It is recommended that the application for reclassification be accompanied by a certified copy of a declaration of intent to establish legal domicile in the state, which intent must have been filed with the Clerk of the Circuit Court, as provided by Section 222.17, Florida Statutes. If the request for reclassification and the necessary documentation is not received by the registrar prior to the day fees are due for the term in which the student intends to be reclassified, the student will not be reclassified for that term.

(6) Appeal from a determination denying "resident for tuition purposes" status to applicant therefor may be initiated after appropriate administrative remedies are exhausted by the filing of a petition for review pursuant to Section 120.68 Florida Statutes.

(7) Any student granted status as a "resident for tuition purposes," which status is based on a sworn statement which is false shall, upon determination of such falsity, be subject to such disciplinary sanctions as may be imposed by the president of the university.

Specific Authority 240.209(1), (3)(g) FS. Law Implemented 120.53(1)(a), 240.209(1), (3)(d), (g), 240.233, 240.235, 240.1201, 240.137(5) FS. History—Formerly 6C-2.51, 11-18-70, Amended 8-20-71, 6-5-73, 3-4-74, Amended and Renumbered 12-17-74, Amended 1-13-76, 12-13-77, 8-11-81, 6-21-83, 12-13-83, 6-10-84, 10-7-85, 12-31-85. Formerly 6C-7.05, Amended 11-9-92.

EXPENSES

APPLICATION FEE

Each application for admission to the University must be accompanied by an application fee of $20. Application fees are nonrefundable. Further instructions will be found in the *Admissions* section of this *Catalog*.

ENROLLMENT AND STUDENT FEES

Pursuant to Section 6C-7.002(10) Florida Administrative Code, enrollment is defined as a student's registration for one or more course(s) and full payment of tuition and material and supply fees for the courses without receiving a refund.

The *University Calendar* appearing at the front of this catalog sets forth the beginning and ending dates of each semester. Registration must be completed on or before the proper due date as specified in the calendar. Students are not authorized to attend class unless they are on the class roll or have been approved to audit and have paid the audit fees.

A student must be registered during the terms of the qualifying examination and the final examination, and during the term in which the degree is awarded.

FEE LIABILITY

A student is liable for all fees associated with all courses in which he/she is registered at the end of the drop/add period. The fee payment deadline is 3:30 p.m. at the end of the second week of classes. The *University Calendar* appearing at the front of this *Catalog* sets forth the specific dates.

ASSESSMENT OF FEES

Resident and nonresident tuition is assessed on the basis of course classification: tuition for courses numbered through 4999 is assessed at the undergraduate level; courses numbered 5000 and above are assessed at the graduate level. The fee structure for graduate-level courses for the academic year 1993-94 is as follows:

Course Level	Florida Resident	Non-Florida Resident
5000-7999*	$108.45	$361.47**

*Includes thesis and dissertation courses.
**This figure includes in-state fees.

A student must be registered during the terms of the qualifying examination and the final examination, and during the term in which the degree is awarded.

Students must assess and pay their own fees. **University personnel will not be held accountable for proper assessment or mathematical accuracy of calculations.**

A schedule of tuition fees for all programs can be obtained by contacting University Financial Services, S-113 Criser Hall.

Health, Material and Supply, Athletic, and Activity and Service Fees

Health Fee.—All students must pay a specified health fee which is assessed on a per credit hour basis and is included in the basic per credit hour rate. The health fee is for the purpose of maintaining the University's Student Health Service and for the student's privilege of utilizing said service. This fee is not part of any health insurance a student may puchase.

Athletic Fee.—All students must pay a specified athletic fee per credit hour each term. Half-time graduate research and teaching assistants enrolled for eight or more credit hours during the fall or spring semesters and all other students enrolled for nine or more credit hours are eligible to purchase athletic tickets at the student rate.

Activity and Service Fee.—All students must pay a specified activity and service fee, which is assessed on a per credit hour basis and is included in the basic per credit hour rate.

Material and Supply Fee.—Material and supply fees are assessed for certain courses to offset the cost of materials or supply items which are consumed in the course of the student's instructional activities. Specific information on material and supply fees may be obtained from academic departments or University Financial Services.

Late Registration/Payment Fee

Late Registration Fee (6C-7.003(4), Florida Administrative Code).—Any student who fails to initiate registration during the regular registration period will be subject to the late registration fee of at least $50.00 and no more than $100.00.

Late Payment Fee (6C-7003(5), Florida Administrative Code).—Any student who fails to pay all fees due or make appropriate arrangements for fee payment (deferment or third party billing) by the fee payment deadline will be subject to a late payment fee of at least $50.00 and no more than $100.00.

Waiver of Late Fees.—A student who believes that any of the late charges should not be assessed, because of University error or because extraordinary circumstances prevented all conceivable means of complying with established deadlines, may petition for a waiver of the late fees by submitting a petition for the waiver with the appropriate office as follows:

Late Registration fee: Office of the University Registrar.
Late Payment Fee: University Financial Services.

The University reserves the right to require documentation to substantiate the extraordinary circumstances.

Special Fees and Charges

Audit Fee.—Fees for audited courses are the same as the credit hour fee charged for Florida students. The audit fee is the same for Florida and non-Florida students.

Graduate Record Examination.—The General Test of the Graduate Record Examination is required for admission to the Graduate School. The fee is $48.00. Students who take one of the advanced tests of the GRE in combination with the General Test pay a total of $96.00. These fees are payable to the Educational Testing Service, Princeton, N J 08540.

Graduate School Foreign Language Test.—All students wishing to be certified as proficient in a reading knowledge of French, German, or Spanish must take the Educational

Testing Service (ETS) Graduate School Foreign Language Tests. A fee of $5.00 covers the cost of this examination. Administrative arrangements to register and pay for this examination must be made through the Office of Instructional Resources, 1012 Turlington Hall.

Library Binding Fee.—Candidates for a graduate degree with a thesis or dissertation pay a $13.90 charge for the permanent binding of the two copies deposited in the University of Florida Library. This charge is payable at University Financial Services by the date specified in the *Graduate Catalog*. A copy of the receipt must be presented at the Graduate School Editorial Office, 168 Grinter Hall.

Microfilm Fee.—A fee of $50.00 is charged for the publication of the doctoral dissertation by microfilm. This fee is payable at University Financial Services. A copy of the receipt for this fee must be presented at the Graduate School Editorial Office, 168 Grinter Hall.

Nursing master's students must pay a fee of $40.00 for publication of their theses. Again, this fee is payable at University Financial Services and a copy of the fee receipt must be presented to the Graduate School Editorial Office, 168 Grinter Hall.

The above charges may be subject to change without notice.

PAYMENT OF FEES

Payment of fees is an integral part of the registration procedure. Fees are payable on the dates listed in the *University Calendar* appearing at the front of this *Catalog*. Payments are processed by the University Cashier at University Financial Services. Checks, cashier's checks, and money orders written in excess of the assessed fees will be processed and the difference refunded at a later date, according to University policy. Checks from foreign countries must be payable through a United States bank in United States dollars. The University reserves the right to refuse three-party checks, altered checks, and checks that will not photocopy.

Fees over $1.00 may be paid by Mastercard or Visa. The card must be in the name of the student paying fees. The student may present the card and picture identification to the University Cashier at University Financial Services.

A 2% service fee is added to the cost of all taxed, license fees, tuition, or any statutorily prescribed revenue when paid by credit card (F.S. Section 215.322).

Returned checks must be paid in cash, money order, or cashier's check. There is a service fee of $15 or 5% of the face amount of the check, draft, or money order, whichever is greater.

In collecting fees, the University may impose additional requirements as deemed appropriate, including advance payment or security deposit for the services to be provided by the University of Florida.

Payment on all financial obligations to the University will be applied on the basis of age of the debt. The oldest debt will be paid first.

Deadlines

Students are reminded that deadlines are strictly enforced. The University does not have the authority to waive late fees unless it has been determined that the University is primarily responsible for the delinquency or that extraordinary circumstances warrant such waiver.

Cancellation and Reinstatement

The University shall cancel the registration of any student who has not paid any portion of his/her fee liability by the published deadlines.

Reinstatement shall require the approval of the University and payment of all delinquent liabilities including the $50.00 late registration and $50.00 late payment fees. A student whose registration has been cancelled for nonpayment of fees must request reinstatement.

In the event a student has not paid the entire fee liability by the published deadlines, the University shall temporarily suspend further academic progress of the student. This will be accomplished by flagging the student's record which will prevent receipt of grades, the release of transcripts, the awarding of diplomas, the granting of loans and/or registration, the use of University facilities and/or services, and admission to University functions, including Athletic Association events, until the account has been settled in full.

Deferral of Registration and Tuition Fees

A fee deferment allows students to pay fees after the fee payment deadline without being subject to either cancellation of registration for nonpayment of fees prior to the established deadline, or the late payment fee. The University may award fee deferments to students in the following circumstances:

1. Students whose state or federal financial assistance is delayed due to circumstances beyond the control of the student.
2. Students receiving veterans' educational assistance benefits.
3. Students for whom formal arrangements have been made with the University for payment by an acceptable third-party donor.

This deferment covers tuition fee payments only and must be established by the fee payment deadline. Fee deferments are granted based on information from the Office of Student Financial Affairs (financial aid deferments) or the Office of the University Registrar (veterans). Questions of eligibility for a fee deferment should be referred to the appropriate office.

Waiver of Fees

The University may waive fees as follows:

1. Participants in sponsored institutes and programs where substantially all direct costs are paid by the sponsoring agent may waive all fees.
2. State employees who have been employed on a permanent, full-time basis for at least six months may be permitted to waive fees up to a maximum of six credit hours per term on a space available basis only.
3. Intern supervisors for institutions within the State University System may be given one nontransferable certificate (fee waiver) for each full academic term during which the person serves as an intern supervisor. All fees are waived.
4. Persons 60 years of age or older are entitled to a waiver of fees for audited courses (up to 6 credit hours), as provided by Section 240.235(4), Florida Statutes.

The Non-Florida Student Financial Aid fee may not be waived for students receiving an out-of-state fee waiver.

REFUND OF FEES

Tuition fees will be refunded in full in the circumstances noted below:

1. If notice of withdrawal from the University is approved prior to the end of the drop/add period and written documentation is received from the student.
2. Credit hours dropped during the drop/add period.
3. Courses cancelled by the University.
4. Involuntary call to active military duty.
5. Death of the student or member of his/her immediate family (parent, spouse, child, sibling).
6. Illness of the student of such severity or duration, as confirmed in writing by the physician, that completion of the semester is precluded.
7. Exceptional circumstances, upon approval of the University President or his/her designee(s).

A refund of 25 percent of the total fees paid (less building, capital improvement, and late fees) is available if written notice of withdrawal of enrollment from the University is approved prior to the end of the fourth week of classes for full semesters, or a proportionately shorter period of time for shorter terms, and written documentation is received from the student.

First-time students at the University of Florida who withdraw are eligible to receive a pro-rata refund of all tuition and fees, including University housing charges, for up to 60% of their first term. An administrative fee of 5% or $100 (whichever is lower) will be assessed upon the amount of the total charges assessed to the student. The administrative fee will be deducted from the amount to be refunded.

Refunds must be requested at University Financial Services. Proper documentation must be presented when a refund is requested. A waiting period for processing may be required. Refunds will be applied against any University debts.

OTHER GENERAL FISCAL INFORMATION

Students should bring sufficient funds, other than personal checks, to meet their immediate needs. Personal checks will be accepted at University Financial Services for the exact amount of fees and/or other amounts owed the University. Payments on all financial obligations to the University will be applied on the basis of age of the debt. the oldest debt will be paid first. University Financial Services does not cash checks or make cash refunds. Checks written in excess of assessed fees or other amounts paid the University will be accepted and processed, but the excess will be refunded to the student at a later date, according to University policy.

Cashing of Checks.—Students may cash checks at the Reitz Union and the University of Florida Bookstore. There are separate check cashing policies for each area. Generally students must have a University of Florida photo I.D.

Students who have three or more returned checks forfeit the privilege of cashing checks on campus and jeopardize their ability to receive certain types of financial aid.

Picture I.D.—A current valid official University of Florida I.D. card must be presented in order to transact business at the Office of University Financial Services, to cash checks at the Reitz Union and University Bookstores, to pick up tickets for athletic events, for Gator dining accounts, to use the CIRCA computer labs, to use University Libraries, and to use all recreational facilites.

The official I.D. card can be obtained at the I.D. Card Services building behind the HUB. A driver's license, social security card, and $10.00 for new cards or $15.00 for replacement cards are required. Call 392-UFID for more information.

Local Address.—It is the responsibility of the student to be sure that a correct local address is on file with Office of the University Registrar at all times. Change of address forms may be obtained from 222 Criser Hall.

PAST DUE STUDENT ACCOUNTS

All students' accounts are due and payable at University Financial Services, at the time such charges are incurred.

University regulations prohibit receipt of grades, the release of transcripts, the awarding of diplomas, the granting of loans and/or registration, the use of University facilities and/or services, and admission to University functions, including Athletic Association events for any student whose account with the University is delinquent.

PARKING ADMINISTRATIVE SERVICES

All students must register their automobiles, mopeds, or motorcycles at the University Parking Administrative Services Decal Office during their first week of registration at the University. Decal eligibility is determined by the student's local address and student classification. There is a fee for registration and schedule of fines for on-campus vehicle violations. A complete set of rules governing traffic, parking, and vehicle registration may be secured at the Parking Decal Office, 354 North-South Drive. Each student should become familiar with these regulations upon registering at the University. In addition, persons wishing to use the campus bus system may obtain annual or semester bus passes at the Parking Decal Office.

HOUSING

For Graduate and Undergraduate Students with Families.—Apartment accommodations on the University campus are available for students with families. Application should be made as early as possible.

For Single Graduate Students. —Schucht Village apartments and the New Residence Facility are available to graduate and upper-division students. Graduate students are given priority; however, there sometimes is a waiting list for graduate students as well as upper-division students.

APPLICATIONS

Each student must make personal arrangements for housing, either by applying to the Division of Housing Office for assignment to University housing facilities or by obtaining accommodations in private housing. Inquiries concerning University family housing facilities should be addressed to the Family Housing Office, Division of Housing, University of Florida, (904)392-2161. Inquiries about private housing accommodations should be addressed to the Off-Campus Housing Office, Division of Housing, University of Florida.

An application for on-campus housing may be filed at any time after a student is admitted to the University. Students are urged to apply as early as possible because of the demand for housing.

Graduate students living in University housing are required to qualify as full-time students as defined by the University, and they must continue to make normal progress toward a degree as determined by their supervisory committees.

RESIDENCE HALLS FOR SINGLE STUDENTS

Various types of accommodations are provided by the University. The double room for two students is the most common type. Several of the larger rooms or suites are designated as triple rooms. Suites for two students consist of two connected rooms—a bedroom and a study room. Carpeted and air-conditioned suites for four, available in Beaty Towers, include two bedrooms, a private bath, and a study-kitchenette.

Carpeted and air-conditioned apartments for four are available in the New Residence Facility and include four single bedrooms, two baths, a kitchen, and a living room. Yulee Scholarship Hall contains air-conditioned single rooms. For information on rental rates, contact the Assignments Section, Division of Housing, University of Florida, (904)392-2161.

COOPERATIVE LIVING ARRANGEMENTS

There are four different cooperative living groups at the University of Florida. Two of these groups are located on campus and are operated by the University of Florida, Division of Housing.

Among the qualifications for membership are scholastic ability and reference of good character. These cooperative living groups are specifically operated by and for students with limited financial means for attending the University.

Inquiries pertaining to cooperative living on campus are made to the Division of Housing, Assignments Section, University of Florida, (904)392-2161. The cooperative living organizations on campus currently are the North Hall Co-op and the Buckman Co-op. Off-campus co-ops are the Collegiate Living Organization (coed), 117 N.W. 15th Street, and Georgia Seagle Hall (men), 1002 West University Avenue. Inquiries should be made to these addresses.

FAMILY STUDENT HOUSING

The University operates five apartment villages for eligible students. To be eligible to apply for apartment housing on campus, the following qualifications must be met:

A married student or student parent without spouse who has legal custody of minor children must meet the requirements for admission to the University of Florida, qualify as a full-time student as defined by the University, and continue to make normal progress toward a degree as determined by the supervisory committee.

The student must be a part of a family unit defined as (1) husband and wife with or without one or more children or (2) single parent who has legal custody of one or more minor children who reside with the parent on an ongoing basis.

Residents in all villages must furnish their own linens, dishes, rugs, curtains, or other similar items. Utilities are an additional expense and are billed with the rent.

Corry Memorial Village (216 units) of brick, concrete, and wood construction contains almost an equal number of one- and two-bedroom apartments, with a few three-bedroom units. Some apartments are furnished. Community facilities include a meeting room and a laundry.

Diamond Memorial Village consists of 208 apartments similar in construction to those in Corry Village. All Diamond apartments are unfurnished. Special features include a community building and air-conditioned study-meeting room, laundry facilities, and a study cubicle in each two-bedroom apartment.

Tanglewood Village Apartments, located approximately 1.3 miles south of the central campus, consist of 208 unfurnished efficiency, one- and two-bedroom townhouse units. All units have disposals and two-bedroom units have dishwashers. All one-and two-bedroom units have 1-1/2 baths. Community facilities include a large recreation hall, laundry facilities, and two swimming pools.

University Village South and Maguire Village consist of 348 centrally heated and air-conditioned one-and two-bedroom unfurnished apartments. Community facilities include a pool, laundry, and meeting room. The kitchens are equipped with stoves and refrigerators.

For Maguire Village Only, the student must be part of a family with a combined gross annual income (including grants-in-aid, VA benefits, scholarships, fellowships, and child support payments) which does not exceed, during the period of occupancy, the following maximum income limitations: two persons, $26,700; three persons, $30,050; four persons, $33,350; five persons, $36,050; and six persons, $38,700.

OFF-CAMPUS HOUSING

The purpose of the Off-Campus Housing Office is to assist University of Florida students, faculty, and staff in obtaining adequate off-campus housing accommodations. The Off-Campus Housing Office is a listing and referral agency for rental housing of all types. It is not an enforcement agency. It does not make rental reservations.

Persons who desire to use these services should request by mail or pick up in person at the Housing Office an off-campus housing packet.

This packet contains a list of major apartment housing developments in the Gainesville area with a zone locator map. Also in the packet is an information brochure on rental leases, deposits, rates, and insurances; a city bus route map and schedule; and utility application and hook-up forms. The Housing Office also maintains updated vacancy information on share (roommate wanted), mobile homes, rental houses, and other rental listings for reference during housing business hours, Monday-Friday, 8-12 and 12:30-4:30. At other times, lighted listing boards are available in the breezeway between the Housing Office and the Housing Office Annex.

FINANCIAL AID

Qualified graduate students in every department are eligible for a number of fellowships, assistantships, and other awards. In general, such awards are available to students pursuing either a master's or a doctoral degree. Unless otherwise specified, applications for these awards should be made to the appropriate department chair, University of Florida, on or before February 15 of each year.

Fellows and graduate assistants must pay appropriate in-state and out-of-state tuition. Fellows and trainees are expected to devote full time to their studies. Graduate assistants who have part-time teaching or research duties may register for reduced study loads. Stipends received for their services are subject to withholding taxes.

MINIMUM REGISTRATION

		Summer		
	Fall and Spring	A & B	or C	
Full-Time Graduate Students Not on Appointments	12	4	4	8
Assistants on .01-.24 and/or Fellows and Trainees	12	4	4	8
Assistants on .25-.49 and/or 1/4 & 1/3-Time Assistants	9	3	3	6
Assistants on .50-.74 and/or 1/2-Time Assistants	8	3	3	6
Assistants on .75-.99 and/or 3/4-Time Assistants	6	2	2	4
Full-Time Assistants:				
1.00 Fall & Spring	3			
1.00 Summer A		2		or 2
1.00 Summer B			2	or 2
1.00 Summer C		1 & 1		or 2
Part-Time Graduate Students Not on Appointment	3	1 & 1		or 2
Graduate Students Not on Appointment During Final Term	3	1 & 1		or 2

NOTE: Registration requirements listed here do not apply to eligibility for financial aid programs administered by the Office for Student Financial Affairs.

Students who do not register properly (according to the above table) in each semester in which they hold graduate assistantships will not be permitted to remain on assistantships.

For students on appointment for the full summer, minimum registration must total that specified for C term. Registration may be in any combination of A, B, or C terms. However, courses must be distributed so that the student is registered during each term that he/she is on appointment. Students on appointment registering for any summer term must register at the beginning of A term.

OFFICE OF STUDENT FINANCIAL AFFAIRS

Financial assistance is also available to graduate students through the Office for Student Financial Affairs in Criser Hall (see *Part-Time Employment* and *Loans*). Students who wish to apply for work or loan programs administered by Student Financial Affairs must fill out the forms in the Gator Aid application packet. Students who receive assistance through Student Financial Affairs must be registered for 9 hours to receive aid for all programs administered by that office except Federal Family Education Loans (unsubsidized and subsidized federal Stafford Loans and federal Supplemental Loans for Students) and the federal Work-Study program. Students receive federal Stafford Loans or federal Work-Study during the summer are required by the Student Financial Affairs Office to register for five hours for the entire summer session with at least 2.5 hours in Summer A.

UNIVERSITY-WIDE AWARDS

In-State Matriculation Fee Waivers are available to graduate assistants and fellows who meet the eligibility requirements.

Non-Florida Tuition Waivers are available, to out-of-state students who hold graduate assistantships or fellowships and who meet the eligibility requirements.

Graduate Assistantships up to one-half time are available through individual departments. Stipend rates paid are determined by the employing department or unit.

Interested students should inquire at their department offices concerning the availability of assistantships and the procedure for making application. Prospective students should write directly to their major departments as well as to the Admissions Office. *Early inquiry is essential in order to be assured of meeting application deadlines.* Appointments are made on the recommendation of the department chairperson, subject to admission to the Graduate School and to the approval of the Dean of the Graduate School. Clear evidence of superior ability and promise is required. Reappointment to assistantships requires evidence of continuation of good scholarship.

MINORITY FELLOWSHIPS

The Board of Regents (BOR) Summer Program for African-American Graduate Students is state funded. It is a six-week program in Summer B designed to prepare African-American students for graduate education at the University of Florida. The 1992 stipend is approximately $1,500. Black students admitted to any master's, doctoral, or professional program for the first time will be invited to participate. Students who participate in the Summer Program must enroll as full-time students for the following academic year.

Graduate Minority Fellowships are available to U.S. citizen or permanent resident minority students enrolled in all graduate programs. The stipend is $8,000 for nine months. Applications should be made to the department by February 15 of each year. These awards require no service; recipients must be full-time students. An additional assistantship of no more than one-fourth time may be held with the approval of the Graduate School.

Harris Fellowships are designed to attract U.S. citizen or permanent resident by minority students into graduate and professional degree programs in which they have been under-represented. The maximum stipend is $14,000 for 12 months. In addition, all tuition and fees are paid. Fellowships are subject to availability of federal funding. Applications should be made to the department by February 15.

The Jose Marti Scholarship Challenge Grant Fund is a need-based grant established to provide financial assistance to Hispanic-American students or students of Spanish culture with origins in Mexico, South America, Central America, or the Caribbean, regardless of race. Applicants must be of Hispanic descent, U.S. citizens enrolled full-time as undergraduate or graduate students, and have a demonstrated financial need; must maintain a cumulative 3.0 grade point average. The stipend is $2,000 per year for up to four semesters of graduate study. Contact the Office of Student Financial Assistance, Florida Department of Education, 1344 FEC Building, Tallahassee, FL 32399-0400.

With the **McKnight Black Doctoral Fellowships**, the Florida Education Fund is attempting to increase the number of African-American U.S. citizens enrolled in doctoral degree programs at universities in the State of Florida. The stipend is $11,000 for 12 months. In addition, all tuition and fees are paid. Applications are available from the Florida Education Fund, 201 E. Kennedy Blvd., Suite 1525, Tampa, FL 33602 (813) 272-2772. Application deadline is January 15.

The Seminole-Miccosukee Indian Scholarship provides financial assistance to Florida's Seminole or Miccosukee Indians. The applicant must be a Seminole or Miccosukee Indian residing in Florida and must be a full-time undergraduate or graduate student. The amount of the award is based on financial need and awarded to the student on the recommendation of the tribe. Contact the Office of Student Financial Assistance, Florida Department of Education, 1344 FEC Building, Tallahassee, FL 32399-04200.

COMMUNICATION PROCESSES AND DISORDERS

Graduate assistantships are available through departmental resources along with traineeships and fellowships from facilities, such as the VA Medical Center and J. Hillis Miller Health Science Center. These assistantships are awarded on the basis of academic qualifications and are competitive.

Additional information may be obtained from the Department of Communication Processes and Disorders.

EDUCATION

Florida Teacher Scholarship and Forgivable Loan Program was established to attract promising upper-division and graduate students to the teaching profession in areas designated critical teacher shortage areas by the State Board of Education. Recipients must teach in Florida in their field of study to cancel their indebtedness or must repay the scholarship at prevailing interest rates. Applicants must be accepted for enrollment in an approved teacher education program, pursuing certification in a designated critical teacher shortage area; awards for graduate students are based on grade point averages and GRE scores. Stipend is up to $4,000 per academic year for up to two years. Applicants should be sent to the Office of Student Financial Assistance, Florida Department of Education, 1344 FEC Building, Tallahassee, FL 32399-0400. Application deadline is April 1.

Many graduate students in education receive financial aid through assistantships and traineeships made available by governmental and foundation grants for research and special programs. The number and nature of these awards vary with each academic year and during the year. Qualified students interested in financial support should maintain contact with the chairperson of the major department and may receive additional information by contacting the Office of Student Services, 134-E Norman Hall.

ENGINEERING

Financial aid to graduate students in engineering is available through approximately 750 research and teaching assistantships requiring one-fourth to three-fourths time work loads with minimum stipends of at least $7.50 per hour. Information regarding application for these positions may be obtained from the office of the graduate coordinator of the department of interest or from the Office of the Associate Dean for Academic Affairs, College of Engineering.

Agricultural Engineering has several graduate academic awards including USDA National Needs Fellowships of $17,000 per year.

The Greiner Professional Scholarship for $1,800 is for a graduate student pursuing the Master of Civil Engineering degree.

The Department of Environmental Engineering Sciences has several scholarships/fellowships available, at varying stipends, made possible by individual and corporate sponsors. These include the Herbert E. Hudson Award, the CDM Fellowship, the Montgomery-Watson Fellowship, and the Jones-Edmunds Scholarship. Details are available from the Department.

The Howard-Mills-Hawkins Scholarship is $1,000 for one year for a graduate student in chemical engineering.

Industrial and Systems Engineering will make available a grant of up to $2,000 for one year for deserving entering graduate students in that department. The financial aid may be used to supplement assistantship or fellowship awards, with preference given to U.S. citizens and minorities.

The Kimley-Horn Scholarship for $1000 is for a new graduate student in civil engineering.

Materials Science and Engineering provides several departmental scholarship awards of up to $12,000 per year to beginning graduate students. Scholarships are awarded competitively on the basis of research interests, GRE scores, undergraduate academic performance, and letters of recommendation.

Mechanical Engineering has several graduate student awards in amounts ranging from $500 to $10,000 per year which are provided by private and industrial organizations. Considerations include U.S. citizenship, financial need, and outstanding records of academic and/or industrial experience.

The Morton Award of $3,150 plus a fee waiver supports graduate students in electrical engineering. Recipients must be U.S. citizens. Among equal nominees, preference is given to women.

The nuclear engineering sciences and environmental engineering sciences programs have been accredited for Department of Energy Fellowships in health physics, operational health physics, nuclear engineering, high level radioactive waste management, and environmental restoration and waste management. These awards pay all tuition and fees plus a $1,200 monthly stipend. Consideration includes U.S. citizenship, career objectives, and excellent academic records.

Institute of Nuclear Power Operation Fellowships are awarded and administered by the Nuclear Engineering Sciences Department and the Environmental Engineering Sciences Department. These fellowships are awarded for a

one-year master's-degree program and provide a stipend to the student of $11,000 for the academic year, with an additional $1,000 educational allowance for the university to defray costs of tuition, fees, etc.

The Dr. James E. Swander Memorial Scholarship Fund of various amounts is for outstanding graduate students in nuclear engineering sciences. Awards are based on scholarship, leadership, and character.

FULBRIGHT-HAYS GRADUATE FELLOWSHIPS FOR STUDY ABROAD

Through the Institute of International Education, graduate students who are American citizens can apply for one of approximately 700 awards to 70 countries. The awards, which are for a year of research or serious study at foreign universities, are provided by the United States, foreign governments, universities, corporations, and private donors. There are special categories for the creative and performing arts and in some cases for teaching assistantships in conversational English. Applications open for the following academic year late each May and close late in September. Local interviews are held in October. Final selections are made by the host country, notification being given in the spring. Fluency in the language of the host country is required in most cases. Most grants cover transportation, tuition, and living expenses for the student but not for dependents. Travel grants are available for students holding other fellowships to universities in certain specified foreign countries. Information, applications, and advice are offered by the Fulbright Program Adviser, Dr. Karelisa Hartigan, 352 Little Hall.

HORTICULTURE

The American Orchid Society-11th World Orchid Conference Fellowship is supported by an endowment established by the sponsoring groups and is awarded to a qualified undergraduate or graduate student in environmental horticulture or botany. Selection of the recipient is based on academic record and an interest to pursue a study of orchids. The Department of Environmental Horticulture, within the horticultural science program, administers the fellowship with annual awards ranging from $500 to $2,500. An individual may receive the award for two consecutive years. For further information, contact the Scholarship Coodinator, Department of Environmental Horticulture, prior to April 15.

The H. Harold Hume Scholarship is awarded by the Florida Federation of Garden Clubs to a qualified graduate student in environmental horticulture. Selection of the recipient is based on academic record, character, aptitude, Florida residency, and financial need. The Department of Environmental Horticulture, within the horticultural science program, administers the scholarship which carries an award of up to $3,000 annually. For further information, please contact the Scholarship Coordinator, Department of Environmental Horticulture, prior to April 15.

JAMES W. KYNES MEMORIAL SCHOLARSHIP

This scholarship is for student athletes who have completed a baccalaureate degree at the University of Florida. Applicants must have exhibited an outstanding performance in both academics and athletics and must be of high personal integrity. Applicants must certify admission to a graduate or professional field of study a the University. The stipend is $7,500 plus tuition waiver (for graduate degrees only) for one year. For additional information, contact James W. Kynes Memorial Scholarship Committee, C/O Graduate School, 284 Grinter Hall. Application deadline is April 15.

LAW (TAXATION)

Limited financial aid is available. For information contact the Graduate Tax Office, College of Law, Holland Law Center.

MASS COMMUNICATION

Fellowships or assistantships are offered under the Brechner, Claudia Ross, Dolgoff, Flanagan, and Pickard programs. Additional graduate grants and assistantships are funded out of the college's resources and through research grants. Several graduate students hold assistantships in other units of the University. Aid is awarded on the basis of academic qualifications or experience. For information contact the Graduate Division, College of Journalism and Communications, Weimer Hall.

MEDICINE

Predoctoral fellowships and part-time teaching and research assistantships are available for graduate students in the various basic medical science departments participating in the Ph.D. program. In addition, some clinical and basic science departments offer postdoctoral fellowships to selected recent recipients of the M.D. or Ph.D. degree who wish extensive research experience in these disciplines. For information write the Associate Dean for Graduate Education, College of Medicine, P.O. Box 100215, Health Science Center.

NURSING

Limited financial aid is available. For information contact the Assistant Dean for Graduate Studies, College of Nursing, J. Hillis Miller Health Science Center.

PHARMACY

It is the policy of the College of Pharmacy that each graduate student receive support from either outside fellowships or University graduate assistantships. All students are required to participate in teaching as a part of the overall educational component of their studies while in the college.

American Foundation for Pharmaceutical Education Fellowships.—A number of graduate fellowships are offered by the American Foundation for Pharmaceutical Education. Holders of these fellowships may pursue graduate work at the University of Florida. Applications should be made to the Foundation, 618 Somerset Street, P. O. Box 7126, North Plainfield, N J 07060.

PSYCHOLOGY

Financial support is available to assist students in pursuing graduate work leading to the doctoral degree. In addition to University-wide awards, current financial assistance includes graduate teaching and research assistantships, National Institute of Child Health and Human Development Traineeships, the Center for Neurobiological Sciences Fellowships, and North Florida Evaluation and Treatment Center Traineeships. For information write the Graduate Secretary, Department of Psychology.

TITLE VI—FOREIGN LANGUAGE AND AREA STUDIES FELLOWSHIPS

Title VI fellowships are available to graduate students whose academic programs are either Latin America or Africa oriented. Applicants must be U.S. citizens or permanent residents and must be registered for a full-time course load including a language relevant to the area of their choice, specifically, Portuguese or Haitian Creole for recipients through the Center for Latin American Studies; Shona, Swahili, or Yoruba for recipients through the Center for African Studies.

Applicants may choose to major in any discipline or department where a Latin American or African emphasis is possible. Remuneration will consist of a $7,000 stipend for the academic year and $1,250 for the summer plus payment of all tuition and fees.

For further information, please contact the Director of either the Center for Latin American Studies (319 Grinter Hall) or the Center for African Studies (470 Grinter Hall), University of Florida.

PART-TIME EMPLOYMENT

The University of Florida Student Employment Office in S-107 Criser Hall coordinates part-time on- and off-campus employment through the following three employment programs: the Federal Work-Study program (FWSP), Other Personnel Services (OPS), and off-campus jobs. Federal Work-Study jobs are based on financial need. To apply for College Work-Study, students should pick up Gator Aid application packets from Student Finanical Affairs as soon as possible after January 1 each year. To apply for OPS, students should check with the Student Employment Office. Off-campus jobs lists are posted on the job bulletin boards, and students simply need to contact the employers.

Student Employment maintains job bulletin boards for all three programs at the following locations: on the south wall of the Criser courtyard, in room 305 of the J. Wayne Reitz Union on the student government bulletin board, McCarty Hall first floor, Norman Hall first floor, and the Medical Sciences Building lobby. The job board at Criser Hall is updated daily. Job boards at the other locations are updated twice weekly.

NEXUS TAPES

The Office for Student Financial Affairs has prepared a series of brief tapes for the NEXUS telephone tape series to provide current information on financial aid programs. To use this service, students should dial (904) 392-1683 and request the tape they wish to hear: 402-A—Applying for Financial Aid; 402-B—Loans; 402-C—Insured Student Loans; 402-D—Student Budgets; 402-E—Aid for Graduate Students; 402-F—Part-Time Employment; 402-G—Grants; 402-H—Scholarships; 402-I—Loans and Debt Management; 402-J—Financial Aid Phone Numbers; 402-K—How Your Financial Aid Is Disbursed; 402-L—Registration Period Update; and 402-M—Financial Aid for Students with Disabilities.

LOANS

At the University of Florida, graduate students may apply for the following student loans: federal Stafford Loans, University of Florida Institutional Loans, federal Perkins Loans, and federal Supplemental Loans for Students (FLS). These programs offer long-term, low-interest loans that must be repaid when the borrower graduates, withdraws, or drops to less than half-time enrollment.

In general, students may borrow up to the cost of attendance minus any other financial aid per academic year at interest rates from 5% to 12% annually. The actual amount of each loan, except for SLS, is based on financial need. Some loans are based on financial need; other are not.

To apply, students should pick up a *Gator Aid* application packet from the Office for Student Financial Affairs in S-107 Criser Hall. *Students should not wait until they have been admitted to apply for aid.* For fall loans, applications should be submitted as soon as possible after January 1. Although students may apply for federal Stafford Loans and federal Supplemental Loans for Students throughout the year, they must observe the deadlines set each semester for applying for loans for the following semester and should always apply as early as possible. The deadline dates are printed in the *Gator Aid* application packet.

The University also has a short-term loan program to help students meet temporary financial needs related to educational expenses. Graduate students may borrow up to $400 or the amount of in-state tuition if they have an acceptable repayment source. Interest is 1% per month and these loans must be repaid by the first day of the last month in the semester in which the money is borrowed. Processing time is approximately 48 hours. Applications are available in Student Financial Affairs.

CATALOG OF GRADUATE AND POSTDOCTORAL SUPPORT

The Division of Sponsored Research (DSR) provides a compendium of funding sources for graduate study. This booklet displays information on hundreds of fellowship, scholarship, loan, and grant opportunities for graduate and recent postdoctoral students. The information is continually up-dated and expanded by the Program Information Office.

At the beginning of each fall semester copies are sent to all graduate coordinators and campus libraries. Students may consult the files at the Program Information Office (392-4804), 256 Grinter Hall.

SPECIAL FACILITIES AND PROGRAMS

RESEARCH AND TEACHING FACILITIES

ART GALLERIES

Samuel P. Harn Museum of Art opened to the public in 1990, providing up-to-date facilities for the exhibition, study, and preservation of works of art. The Harn endeavors to attract and serve a broad public audience as well as fulfill the research and educational missions of a university museum.

The Museum offers a full range of educational programs for the general public as well as the academic community. University students have research and study opportunities, while visitors of all ages benefit from the films, lectures, tours, and workshops. Museum hours are 11 a.m. to 5 p.m., Tuesday through Friday; 10 a.m. to 5 p.m., Saturday; and 1 p.m. to 5 p.m., Sunday.

The University Gallery is an integral part of the Fine Arts complex. The Gallery is located on the campus facing S.W. 13th Street (U.S. 441). An atrium and sculptural fountain are two pleasing features of the Gallery's distinctive architectural style. The University Gallery exhibits contemporary local, national, and international art of the highest quality. Each exhibit shows for approximately four weeks; Gallery hours are 10 a.m. to 8 p.m., Tuesday; 10 a.m. to 5 p.m., Wednesday through Friday; and 1 to 5 p.m. on Saturday and Sunday. The University Gallery is closed on Mondays and holidays and for three weeks in August.

The Department of Art's gallery, **Focus**, is located adjacent to the department's office area, on the third floor of the classroom building in the Fine Arts complex. Focus Gallery exhibits one-person and small-group exhibitions of merit, as well as student exhibitions. The Gallery is open Monday through Friday from 9 a.m. to noon and from 1 to 4:30 p.m. It is closed Saturday and Sunday.

The **Grinter Gallery** is located within the lobby of Grinter Hall. Supported by the Graduate School, the Center for Latin American Studies, and the Center for African Studies, the Grinter Galleries display changing exhibitions of art and cultural materials on Latin American, African, and other international topics. The Galleries are open Monday through Friday from 10 a.m. to 4 p.m.

COMPUTATIONAL FACILITIES

Northeast Regional Data Center (NERDC)

The University of Florida is the host campus for the Northeast Regional Data Center (NERDC) of the State University System of Florida. NERDC's facilities are used for instructional, administrative, and research computing for the University of Florida and for other state educational institutions and agencies in northern Florida. The organizations directly responsible for supporting computing activities at the University of Florida are

- Center for Instructional and Research Computing Activities (CIRCA),
- Faculty Support Center for Computing,
- University of Florida Administrative Computing Services,
- Shands Hospital, Inc., Data Processing Division,
- J. Hillis Miller Health Science Center,
- Institute of Food and Agricultural Sciences (IFAS).

Network Access.—Networks available through NERDC include

- SUS Computer Network, which provides access to the Northwest Regional Data Center in Tallahassee, Florida State University Computing Center in Tallahassee, Central Florida Regional Data Center at the University of South Florida in Tampa, and the Southeast Regional Data Center at Florida International University in Miami,
- The Florida Information Resource Network (FIRN), a Florida Department of Education network,
- BITNET, an international university network, and
- The national Internet, which includes ARPANET, NSFNET, CSNET, and the University of Florida's UFNET Ethernet.

Hardware.—NERDC facilities available to students, faculty, and staff include an IBM ES/9000 Model 740 central processor with 256 megabytes of main memory and three vector facilities. Operating systems include MVS/ESA with JES2, VM/ESA, and AIX, IBM's version of the UNIX operating system. Magnetic storage devices connected to the central processor include IBM 3380 and 3390 disk drives, and 9-track and cartridge tape drives. Telecommunication services are supported by IBM 3705 and IBM 3725 communications controllers. IBM 7171s provide dial-up protocol conversion for selected ASCII workstations so that they can emulate full-screen, 3270-type terminals.

Input and Output.—NERDC provides input and output facilities in the form of magnetic tapes and disks, impact and laser printers, graphics, and computer output microfiche (COM). Two IBM 4245 high-speed printers and two IBM 3820 laser printers provide printed output. Graphics output is available through a Versatec Electrostatic Color Plotter and IBM 3820 laser printers operated at NERDC's central site in the Bryant Space Sciences Research Building. NERDC supports job submission/retrieval and interactive processing through more than 2,000 interactive terminals and microcomputers that emulate terminals. These terminals can access NERDC's timesharing systems (TSO, VM/CMS, AIX, and CICS/VS) for editing, interactive program execution, and batch job submission.

Software.—The major production languages include ASSEMBLER, COBOL, VS FORTRAN, PASCAL, PL/I, and VS/APL. Student-oriented languages supported in selected environments include ASSIST, PL/C, WATBOL, WATFIV, Waterloo C, and Waterloo PASCAL. File management systems and report generators include EASYTRIEVE, MARK IV, and PANVALET. IBM's DB2 is NERDC's primary database management system. TPX allows concurrent interactive sessions from one terminal. Other primary software includes statistical packages (BMDP, SAS, SPSSX, and TROLL), text-formatting programs (TeX; WordPerfect 4.2 for CMS; and IBM DCF and Waterloo SCRIPT, both with spell-checking and formula-formatting capabilities), libraries of scientific and mathematical routines (ESSL and IMSL), graphics programs (GDDM, Versatec plotting software, PLOT79, SAS/GRAPH, and SURFACE II), financial spreadsheets and modelers (Supercalc, and IFPS), vector facility software, mini- and microcomputer support via file-transfer capabilities, the LEARN Grwth Format computer-based training system, local and IBM utilities, and special-purpose languages.

Research Computing Initiative and Numerically Intensive Computing Support.—NERDC and IBM offer a significant but limited amount of free computing time to UF and SUS faculty members to develop programs that use the

high-performance features of the IBM ES/9000 and its three vector facilities. The Faculty Research Computing Initiative Allocation Committee receives and evaluates proposals for computing support. NERDC activities that support numerically intensive computing include periodic workshops, aid in converting programs to take advantage of the vector processors, and advice on the design of new NIC software, and more. To request guidelines, application forms, or additional information, call NERDC at 392-2061.

LUIS.—LUIS (Library User Information Service) is the online card catalog of the SUS libraries. There are LUIS catalogs for each state university system library. The state legislature has funded access to LUIS through the Florida Center for Library Automation (FCLA). Call 392-9020 for information about obtaining free identification numbers for using LUIS.

Additional Information.—More information is available through NERDC's annual *Guidebook*, NERDC's newsletter, */Update*, NERDC documentation, and NERDC Information Services at 112 SSRB, (904) 392-2061.

Center for Instructional and Research Computing Activities (CIRCA)

Services available to graduate students include consulting; documentation; limited programming and analysis; statistical consulting and analysis; noncredit computer courses; thesis production support; VAX/VMS computing; Unix computing; IBM mainframe accounts; mainframe printing; supercomputing access; and the use of interactive terminals, microcomputer laboratories, and microcomputer classrooms.

For instructional purposes, CIRCA operates a Digital Equipment Corporation VAX cluster and a Digital Equipment Corporation RISC Unix computer. These computers can be accessed from CIRCA-supported public terminal facilities, dial-up terminals and microcomputers, and computers on the campus network. Several programming languages and packages for mathematical and statistical analysis are available. For graduate students, accounts for sending and receiving electronic mail on international networks are also available.

Instructors whose courses require the use of CIRCA's VAX/VMS or Unix computers can apply for class accounts. Separate VAX/VMS accounts are available at no charge for students' personal use. All accounts are restricted to a moderate amount of disk space and CPU time and may not be used for research, commercial enterprises, support of campus organizations, or administrative computing. Applications for these accounts are available in the CIRCA offices, E520 Computer Sciences and Engineering (CSE).

IBM mainframe computing services are provided by the Northeast Regional Data Center (NERDC), located on the University of Florida campus. CIRCA distributes NERDC accounts to University of Florida students and faculty for instructional use; research accounts are distributed through individual departments. NERDC services can be used from CIRCA terminal and microcomputer facilities, from dial-up terminals and microcomputers, and from computers on the campus computing network. Mainframe printing is also available at several campus locations. For more information about NERDC facilities and services, see the subsection of this catalog entitled *Northeast Regional Data Center* or , contact the Computing Help Desk, E520D CSE, 392-HELP.

CIRCA microcomputer labs are available to University of Florida students, faculty, and staff for academic and personal use. These labs are equipped with Apple Macintosh, IBM, and IBM-compatible microcomputers. Dot-matrix and laser printers are available at all microlabs; plotters and optical scanners are available at some locations. In addition, several microcomputer classrooms can be reserved for academic courses. Instructors may apply for reservations at CIRCA, E520 CSE.

Additional information about CIRCA and NERDC services is available from the Computing Help Desk in E520D CSE, University of Florida, 392-HELP.

ENGINEERING: STATE CENTER

The College of Engineering has an off-campus graduate engineering and research center at Eglin Air Force Base. Qualified personnel may enroll in courses leading to advanced degrees in several engineering disciplines. For admission to this program, the prospective student must file an application with the Graduate School as outlined in the *Admissions* section of this *Catalog*.

For additional information, visit the University of Florida Graduate Engineering and Research Center Office at Eglin Air Force Base, or write the Dean, College of Engineering, University of Florida.

THE FLORIDA ENGINEERING EDUCATION DELIVERY SYSTEM (FEEDS)

The Florida Engineering Education Delivery System (FEEDS) is a cooperative effort to deliver graduate engineering courses and degree programs via videotape delivery to engineers throughout Florida. Along with the University of Florida, participating universities include the colleges of engineering at Florida State University/Florida A&M University, Florida Atlantic University, Florida International University, the University of Central Florida, and the University of South Florida and the cooperating centers at the University of North Florida and the University of West Florida. Graduate students associated with any of these universities have access to the graduate engineering courses offered via the FEEDS throughout the state during the school term. Students wishing to be admitted to the FEEDS program or wishing to register for classes at the University of Florida should do so by contacting the FEEDS Coordinator, E111 CSE Building. Students pursuing a degree through the College of Engineering at the University of Florida are governed by its requirements, the department to which they have been admitted, and the Graduate School.

UNIVERSITY LIBRARIES

The Libraries of the University of Florida form the largest information resource system in the state of Florida. While the collections are extensive, they are not comprehensive and graduate students will find it useful to supplement them through a variety of services and cooperative programs drawing upon the resources of many other libraries. The following entry describes the UF libraries, local collection strengths and the physical distribution of collections among campus libraries as well as the services available to assist students and faculty in locating needed information.

The Libraries of the University of Florida consist of eight libraries. Six are in the system known as the **George A. Smathers Libraries** of the University of Florida and two (Health Sciences and Law) are attached to their respective administrative units. All of the libraries serve all the

University's faculty and students, but each has a special mission to be the primary support of specific colleges and degree programs. Because of the interdisciplinary nature of research, scholars may find collections built in one library to serve a specific discipline or constituency to be of great importance to their own research in another discipline. It most likely will be necessary to use more than one library to discover all of the resources pertinent to a particular research interest.

The **LUIS** system, your key to the UF libraries collections, has been greatly expanded in recent years. It now offers a diverse information menu. In addition to the online catalog of the holdings of the University of Florida, LUIS contains the catalogs of the other State University System libraries in Florida and of libraries in other states and foreign nations. Several indexes to articles and reports provide citations to journal articles. A new "Library News and Information" section contains library hours, phone numbers, and other practical information. There are also gateways to other information sources—local, national and international.

The **online catalog** eases the difficulty of locating materials as it is accessible from offices, laboratories, and dormitories or homes with workstation access to NERDC. It contains about 96% of the cataloged collections—exceptions are some older humanities and social science titles acquired prior to 1975 as well as some uncataloged special, archival, map, microform, and document collections. Access to many of these collections is available through the Union Card Catalog on the First Floor of Library West, specialized catalogs in Special Collections and Documents, or other finding aids in Microtexts and the Map Collection. Reference staff throughout the libraries can provide instruction in the use of LUIS and/or written instructions for self help.

CyberLibrary is a new service which is accessible from the main LUIS menu. It has developed into a system of user-friendly menus that provide access to a wealth of information about the UF Libraries, electronic journals, academic electronic discussion lists, Internet access tools, and more. Several electronic publications received by the Libraries which do not exist as print publications can be read in CyberLibrary. Examples include *Post Modern Culture, BrynMawr Classical Review, Leonardo Electronic News, Central America Update, Chronicle of Latin American Economic Affairs,* etc.

Owing to disciplinary variation in research methods, the policies enforced and the services offered may differ from library to library. Most of the libraries have an advisory board consisting of faculty and students who advise on the policies and services relating to their library. Information on **local policies** is available at the circulation and reference desks in each library.

As is common in research libraries, library materials are housed in a variety of locations depending upon discipline.

- **Library West** holds most of the humanities and social science collections, as well as professional collections in support of business, health and human performance, and journalism. The Documents Collections are major holdings of all federal documents (excepts the science related holdings in Marston), many state and local documents, and selected holdings of international and foreign documents.
- **Smathers Library** holds the Latin American and Judaica collections, and the Special Collections—rare books and manuscripts, P. K. Yonge Library of Florida History, and University Archives.
- **Marston Science Library** holds most of the agriculture, science, and technology collections as well as the Map Library. It also houses the federal documents published by the USDA, NASA, Patent Office, and USGS.
- **Architecture/Fine Arts Library** (201 Fine Arts Building A) holds visual arts, architecture, and building construction materials.
- **Education Library** (1500 Norman Hall) holds most of the education collections.
- **Music Library** (231 Music Building) holds most music materials and a collection of recordings.
- **Journalism Reading Room** holds a small collection of materials relating to journalism and mass communication.
- **Health Science Center Library** holds major resources for the medical sciences, related life sciences, and veterinary medicine.
- **Legal Information Center** holds major resources for law and related social sciences.

Together the Libraries hold over 3,000,000 cataloged volumes, 4,200,000 microforms, 1,000,000 documents, 550,000 maps, and 20,000 computer datasets. The Libraries have built a number of nationally significant research collections primarily in support of graduate research programs. Among them are the **Baldwin Library of Children's Literature** which is among the world's greatest collections of literature for children (Smathers Library, Special Collections); the **Map and Imagery Library** which is an extensive repository of maps, atlases, aerial photographs, and remote sensing imagery with particular collection strengths for the southeastern United States, Florida, Latin America, and Africa south of the Sahara (Marston Science Library, Level One); the **Isser and Ray Price Library of Judaica** which is the largest collection of its kind in the Southeast (Smathers Library, fourth floor); and the **P.K. Yonge Library of Florida History**, which is the state's preeminent Floridiana collection and holds the largest North American collection of Spanish colonial documents concerning the southeastern United States as well as rich archives of prominent Florida politicians (Smathers Library, Special Collections).

The Libraries also have particularly strong holdings in **architectural preservation** and **18th-century American architecture** (AFA), **late 19th- and early-20th-century German state documents** from 1850-1940 (Library West), **Latin American art and architecture** (AFA and Smathers Library), **national bibliographies** (Library West, Reference), **U.S. Census information**, especially in electronic format (Library West, Documents), the **rural sociology of Florida** and **tropical and subtropical agriculture** collections (Marston Science Library), **English and American literature** (Library West), **U.S. documents** (Library West, Documents), and **computing files** acquired primarily through the Inter-University Consortium for Political and Social Research (Tape Library, request at Library West, Reference).

All students and faculty are provided library services upon presentation of the University of Florida machine readable ID card. This card is used to circulate books, to borrow reserves, and to establish identity for other library services such as **Interlibrary Loan** and **online searching**. **Reference service** is provided to library users in each library and is also available via telephone and E-Mail. All of the libraries provide special services to assist students and faculty with disabilities in their use of the libraries; information is available at all circulation desks. At the beginning of each semester, the Libraries offer **orientation programs** designed to teach those new to campus what services are available and how to use them. Schedules are posted in each library at the beginning of each term. **Individual**

assistance is available at the reference desk in each library. In addition, instructional librarians will work with faculty and teaching assistants to develop and present course specific library instruction sessions. Instruction coordinators are available in Humanities and Social Science Reference in Library West, in Marston Science Library, and in the branches.

Subject specialists, who work closely with faculty and graduate students to select materials for the collections, also advise graduate students and other researchers who need specialized bibliographic knowledge to define what information resources are available locally and nationally to support specific research. A good time to consult the subject specialists is when beginning work on a major research project or developing a working knowledge of another discipline. A list of subject specialists is available at reference desks and users may schedule a meeting with the appropriate specialist.

The Libraries are members of the **Research Libraries Group** and the **Center for Research Libraries** which gives faculty and students access to many major scholarly collections. In addition, the libraries are linked to major national and international databases such as RLIN, OCLC, NEXIS/LEXIS, DIALOGUE, and QUESTEL. Many materials that are not held on campus can be quickly located and borrowed through one of the **cooperative programs** to which the Libraries belong. Consult with a reference librarian to take advantage of these services. Publications describing specialized services are available at reference and circulation desks throughout the Libraries.

Current information regarding **library hours** may be obtained by selecting **Library Hours and Phone Numbers** from the LUIS menu or calling the desired library (392-0341 for Library West and Smathers, 392-2758 for Marston Science Library).

MAJOR ANALYTICAL INSTRUMENTATION CENTER (MAIC)

The Major Analytical Instrumentation Center (MAIC) was established in 1982 to help make available complex modern analytical instrumentation and to promote its efficient usage on the campus and in the state. This is accomplished by coordinating campuswide usage, helping to provide resources for maintenance, upgrading existing instruments and developing new techniques, planning purchases of major new instruments, training and supervising users, and providing professional scientists to supervise the solution of individual problems. Center personnel also direct users to other campus facilities, if necessary. For example, the Institute of Food and Agricultural Sciences (IFAS) and the Department of Chemistry both have a number of analytical facilities that are available to some users.

The instruments involved include several electron microscopes (TEM, SEM, AEM) with full analytical and imaging capabilities, instruments directed toward surface analysis (i.e., AES, ISS, SIMS and XPS, RBS, PIXE, and NRA), and several mass spectrometers.

Education and training are achieved by a variety of means. The MAIC offers short courses annually in several specialized areas, e.g., scanning electron microscopy, transmission electron microscopy, vacuum technology, surface science, and optical microscopy. These are open both for graduate credit and to those outside the University community. (The Chemistry Department, IFAS, and the Engineering and Industrial Experiment Station also regularly offer several short courses of a complementary nature.) Some individually supervised training directed by Center personnel is available to graduate students.

The overall aim of the MAIC is thus to make possible the solution of any scientific or technological problem that requires state-of-the-art analytical instrumentation and to make these capabilities accessible to all University and state personnel. Cooperation with state industries is also encouraged where this is legal and appropriate.

The administration and professional staff of the MAIC are located in 217 Materials Science and Engineering Building where further information may be obtained upon request.

MONOGRAPH SERIES

The Graduate School sponsors two monograph series devoted to the publication of research primarily by present and former members of the scholarly community of the University. The *Social Sciences Monographs* are published each year with subjects drawn from anthropology, economics, history, political science, sociology, education, geography, law, and psychology. The *Humanities Monographs* are published each year with subjects drawn from art, language and literature, music, philosophy, and religion.

FLORIDA MUSEUM OF NATURAL HISTORY

The Florida Museum of Natural History was created by an act of the Legislature in 1917 as a department of the University of Florida. Through its affiliation with the University, it carried dual responsibility as the Florida museum and the University museum.

The Museum is located at the corner of Museum Road and Newell Drive in a modern facility completed in 1970. The public halls are open from 10 a.m. until 5 p.m., Tuesday through Saturday, and 1 to 5 p.m. on Sundays. The Museum is closed on Christmas Day. There is no admission charge.

The Museum operates as a center of research in anthropology and natural history. Its accessory functions as an educational arm of the University are carried forward through interpretive displays and scientific publications. Under the administrative control of the director are the three departments of the Museum: Natural Sciences, staffed by scientists and technicians concerned with the study and expansion of the research collections of animals; Anthropology, whose staff members are concerned with the study of historic and prehistoric people and their cultures; Interpretation, staffed by specialists in the interpretation of knowledge through museum exhibit techniques and education programs. Members of the scientific and educational staff of the Museum hold dual appointments in appropriate teaching departments. Through these appointments, they participate in both undergraduate and graduate teaching programs.

The Allyn Museum of Entomology, Sarasota, is part of the Department of Natural Sciences of the Florida Museum of Natural History. The combined Sarasota and Gainesville holdings in Lepidoptera rank the Allyn Museum of Entomology as the largest in the western hemisphere and the premier Lepidoptera research center in the world. The Allyn Museum publishes the *Bulletin of the Allyn Museum of Entomology* and sponsors the Karl Jordan Medal. The Allyn Collection serves as a major source for taxonomic and biogeographic research by a number of Museum and

Department of Zoology faculty and students, as well as a great many visiting entomologists from around the world.

The Swisher Memorial Sanctuary and the Ordway Preserve are adjacent pieces of land totalling some 9,300 acres. The land includes an array of habitats including marsh, lakes, sandhills, and mesic hammocks. Jointly administered by the School of Forest Resources and Conservation and the Florida Museum of Natural History, this area supports several research activities centering on the ecology of threatened species and the restoration of the native longleaf pine growth in the sandhills. Thesis and dissertation research projects consistent with the aims of the preserve are actively encouraged.

The herbarium of the University of Florida is also a part of the Museum. It contains over 150,000 specimens of vascular plants and 170,000 specimens of nonvascular plants. In addition, the herbarium operates a modern gas chromatographic/mass spectrometer laboratory for the study and identification of natural plant products.

The research collections are under the care of curators who encourage the scientific study of the Museum's holdings. Materials are constantly being added to the collections both through gifts from friends and as a result of research activities of the Museum staff. The archaeological and ethnological collections are noteworthy, particularly in the aboriginal and Spanish colonial material remains from the southeastern United States and the Caribbean. There are extensive study collections of birds, mammals, mollusks, reptiles, amphibians, fish, invertebrate and vertebrate fossils, plant fossils, and a bioacoustic archive consisting of original recordings of animal sounds. Opportunities are provided for students, staff, and visiting scientists to use the collections. Research and field work are presently sponsored in the archaeological, paleontological, and zoological fields. Students interested in these specialties should make application to the appropriate teaching department. Graduate assistantships are available in the Museum in areas emphasized in its research programs.

OAK RIDGE ASSOCIATED UNIVERSITIES

The University of Florida has been a sponsoring institution of Oak Ridge Associated Universities (ORAU) since 1948. ORAU is a private, not-for-profit consortium of 65 colleges and universities and a management and operating contractor for the U.S. Department of Energy (DOE) with principal offices located in Oak Ridge, Tennessee. Founded in 1946, ORAU provides and develops capabilities critical to the nation's technology infrastructure, particularly in energy, education, health, and the environment. ORAU works with and for its member institutions to help faculty and students gain access to federal research facilities; to keep members informed about opportunities for fellowship, scholarship, and research appointments; and to organize research alliances among our members in areas where their collective strengths can be focused on issues of national importance.

ORAU manages the Oak Ridge Institute for Science and Education (ORISE) for DOE. ORISE is responsible for national and international programs in science and engineering education, training and management systems, energy and environment systems, and medical sciences. ORISE's competitive programs bring students at all levels, K-12 through postgraduate, and university faculty members into federal and private laboratories.

ORAU's office for University, Industry, and Government Alliances (UIGA) seeks out opportunities for collaborative alliances among its member universities, private industry, and federal laboratories. Current alliances include the Southern Association for High Energy Physics (SAHEP) and the Center for Bio-Electromagnetic Interaction Research (CBEIR). Other UIGA activities include the sponsorship of conferences and workshops, the Visiting Scholars program, and the Junior Faculty Enhancement Awards.

Contact F.E. Dunnam, (904) 392-1444, for more information about ORAU programs.

UNIVERSITY PRESS OF FLORIDA

The University Press of Florida is the official scholarly publishing agency of the State University System of Florida.

The Press, which is located just off the University of Florida campus at 15 NW 15th Street, reports to the President of the University, who supervises the Press on behalf of the nine state universities. The statewide Council of Presidents is the governing board for the Press.

An editorial committee, made up of a faculty representative from each of the nine state universities, determines whether manuscripts submitted to it meet the academic, scholarly, and programmatic standards of the Press. The Director of the Press has the discretion to decide which of the manuscripts, receiving the approval of the faculty editorial committee, will be published.

The press publishes scholarly works of intellectual distinction and significance, books that contribute to improving the quality of higher education in Florida, and books of general and regional interest and usefulness to the people of Florida, reflecting their rich historical, cultural, and intellectual heritage and resources. The editorial program of the Press also cultivates areas that reflect the academic strengths of the nine member universities.

The Press publishes works in the following fields: international affairs; the Caribbean and Latin America; Africa; the Middle East; southern archaeology, history, and culture; Native Americans; folklore; postmodern literary theory and contemporary continental letters; the Middle Ages; philosophy; women's studies; ethnicity; natural history and agriculture; health sciences; the fine arts; poetry.

Submissions are not invited in prose fiction or the physical sciences.

Manuscripts may be submitted to the Editor-in-Chief, University Press of Florida, 15 NW 15th Street, Gainesville, FL 32611.

INTERDISCIPLINARY GRADUATE STUDIES

INTERNATIONAL STUDIES

As the oldest and largest institution of higher education in a state at the leading edge of a rapidly changing global environment, the University of Florida has a comprehensive commitment to excellence in international education. It extends from foreign language instruction, area studies programs, study abroad opportunities, and international exchanges into every facet of its teaching, research, and service. The University is dedicated to serving the international interests of Florida and the nation and to preparing its students for the global challenges and opportunities of the 21st century.

During the last three decades, the University of Florida's commitment to international studies has expanded rapidly.

This expansion has resulted in the creation of a Center for Latin American Studies, a Center for African Studies, a Center for Tropical Agriculture, an Office for International Studies and Programs, a program in international relations, and an English Language Institute for speakers of other languages. Programs in African and Asian languages and literatures, Soviet and East European studies, and West European studies have been added to the undergraduate curriculum. The University of Florida has participated in programs of assistance and development in many major areas of the world: Africa, South America, Middle America, and Southeast Asia. There has also been a increase in the number of faculty members involved in teaching and in research within the field of international studies.

In January 1971, the University opened the $1.6 million federally funded Graduate School and International Studies Building, Linton E. Grinter Hall. The modern four-story building contains faculty offices, study cubicles, and seminar rooms, as well as the offices of the Graduate School and the Division of Sponsored Research, the Center for African Studies, Program in African and Asian Languages and Literatures, Center for Jewish Studies, and the Center for Latin American Studies.

As an indication of the University's continuing commitment to international studies and its importance to all areas of graduate education, in September 1991, the Provost created the Office of International Studies with the charge of developing and coordinating the international activities of the University. The Director of this office represents the University on councils and committees related to international academic activities, projects, and enterprises.

The Center for African Studies, one of 10 National Resource Centers on Africa, funded, in part, under Title VI of the Higher Education Act, directs and coordinates interdisciplinary instruction, research, and outreach related to Africa. In cooperation with participating departments throughout the University, the Center offers a Certificate in African Studies at both the master's and doctoral levels. The curriculum provides a broad foundation for students preparing for teaching or other professional careers in which a knowledge of Africa is essential.

Graduate Fellowships and Assistantships.—Students admitted to the Graduate School in pursuit of degrees offered by participating departments are eligible to compete for graduate assistantships and Title VI Foreign Language and Area Studies fellowships.

Extracurricular Activities.—The Center sponsors an annual conference on an African topic, a weekly colloquium series—BARAZA—with invited speakers, and a biweekly film series. The *Carter Lectures on Africa* are held throughout the academic year. The Center also directs an extensive out-reach program addressed to public schools, community colleges, and universities nationwide.

Library Resources.—The Center for African Studies provides direct support for African library acquisitions to meet the instructional and research needs of its faculty and students. The Africana Collection numbers over 80,000 volumes. The Map Library contains 360,000 maps and 165,000 serial photographs and satellite images and is among the top five academic African map libraries in the U.S.

Graduate Certificate Program.—The Center for African Studies, in cooperation with participating departments offers a Certificate in African Studies in conjunction with the master's and doctoral degrees.

Requirements for the Certificate in African Studies with a master's degree are (a) at least 18 credits of course work in a departmental major, 15 of which should relate to Africa; (b) 9 credits of course work related to Africa and distributed in at least two other departments; and (c) a thesis on an African topic.

Requirements for the Certificate in African Studies with the doctoral degree are (a) the doctoral requirements of the major department; (b) 18 credits of course work related to Africa in two or more other departments; (c) a dissertation on an African topic based on field work in Africa; (d) knowledge of a language appropriate to the area of specialization.

Inquiries about the various programs and activities of the Center should be addressed to the Director, Center for African Studies, 427 Grinter Hall.

International Relations, a field of specialization leading to the M.A. and Ph.D. degrees, is offered through the Department of Political Science. In addition to the M.A. and Ph.D. with a major in political science which may include a field in international relations, the University offers an M.A. and Ph.D. with a major in political science—international relations. The political science—international relations program is designed to provide professional education to those whose primary interest is a career in foreign relations, whether in the public or private sector. Requirements for the M.A. are an interdisciplinary core of 12 credits and 27 credits in three discipline-based tracks. Two of the three tracks must be in political science; the third may be chosen from a wide range of disciplines, including economics, journalism, agriculture, statistics, computer sciences, or area studies. For the Ph.D., the student must complete the requirements for the M.A. and then has the option of taking (1) either three fields in political science or (2) two fields in political science and a third in another discipline.

The Center for Latin American Studies coordinates teaching, research, and service activities related to Latin America and the Caribbean.

Master of Arts Degree in Latin American Studies. —The master's degree offered through the Center is available in two versions, both of which require a 15-credit major concentration. The **disciplinary** concentration emphasizes training and research in area and language studies, which develop a greater understanding of Latin America's cultures and societies. Students concentrate in one department, which may be Anthropology, Economics, Food and Resource Economics, Geography, History, Political Science, Romance Languages and Literatures (Spanish), or Sociology. This option is especially suited to the needs of students who wish to obtain a well-rounded background in Latin American Studies before pursuing the Ph.D. in a specialized discipline.

The **topical** concentration clusters course work and research around a thematic field focusing on contemporary Latin American problems. Students may concentrate in Brazilian studies, Caribbean studies, international communications, museum studies, population studies, tropical agriculture, and tropical conservation and development. This option builds on prior professional or administrative experiences and prepares students for technical and professional work related to Latin America and the Caribbean.

Other requirements, common to both options, are (1) 15 credits of Latin American area and language courses in two

other departments, including one semester of LAS 6938; (2) a reading, writing, and speaking knowledge of one Latin American language (Spanish, Portuguese, or Haitian Creole); and (3) a thesis on an interdisciplinary Latin American topic.

Although the M.A. in Latin American studies is a terminal degree, many past recipients have entered the Ph.D. programs in related disciplines from which they prepare for university teaching careers. Other graduates are employed in the foreign service, educational and research institutions, international organizations, government agencies, nonprofit corporations, and private companies in the United States and Latin America.

Prerequisites for admission to the program are (1) a baccalaureate degree from an accredited college or university; (2) a grade average of B for all upper-division undergraduate work; (3) a combined verbal-quantitative score of 1000 on the Graduate Record Examination; (4) a TOEFL score of 550 for nonnative speakers of English; and (5) a basic knowledge of either Spanish or Portuguese.

Graduate Certificates in Latin American Studies. — Master's students may earn a Certificate in Latin American Studies along with a degree in agriculture, architecture, business administration, education, fine arts, journalism and communications, and liberal arts and sciences.

Thesis degree candidates must have at least 12 credits of Latin American course work distributed as follows: (1) Latin American concentration within the major department (to extent possible); (2) at least 3 credits of Latin American course work in one department outside the major; (3) 3 credits of LAS 6938; (4) intermediate-mid proficiency in a Latin American language (language courses at the 3000 level or higher will count toward the certificate); and (5) a thesis on a Latin American topic.

Nonthesis master's degree candidates must have at least 15 credit hours of Latin American course work distributed as follows: (1) Latin American concentration within the major department (to extent possible); (2) at least 6 credits of Latin American courses in two other departments; (3) 3 credits of LAS 6938; and (4) intermediate-mid proficiency in a Latin American language (language courses at the 3000 level or higher will count toward the certificate).

Advanced Graduate Certificate in Latin American Studies.—The Center offers the Certificate in Latin American Studies to Ph.D. candidates in the Colleges of Agriculture, Architecture, Business Administration, Education, Fine Arts, Journalism and Communications, and Liberal Arts and Sciences. Candidates for the Advanced Graduate Certificate must have at least 18 credit hours of Latin American course work distributed as follows: (1) Latin American concentration within the major department (to extent possible), (2) 9 credits of Latin American courses in two other departments; (3) 3 credits of LAS 6938; (4) intermediate-plus proficiency in one Latin American language (language courses at the 3000 level or higher will count toward the certificate); (5) research experience in Latin America; and (6) a dissertation on a Latin American topic.

Graduate Fellowships and Assistantships.—In addition to University fellowships and assistantships, the Center for Latin American Studies administers financial assistance from outside sources, including Title VI fellowships.

Research.—The Center supports several research and training programs that provide research opportunities and financial support for graduate students, especially in the Amazonian, Andean, and Caribbean regions.

Library Resources.—The University of Florida libraries contain more than 300,000 volumes of printed works as well as manuscripts, maps, and microforms dealing with Latin America. Approximately 80 percent of the Latin American collection is in Spanish, Portuguese, and French. Holdings represent all disciplines and areas of Latin America but are strongest in the social sciences, history, and literature, and in the Caribbean, circum-Caribbean, and Brazilian areas, with increasing strength in the Andean and Southern Cone regions.

Other Activities.—The Center sponsors conferences, colloquia, and cultural events; supports publication of scholarly works; provides educational outreach service; and cooperates with other campus units in overseas research and training activities. The Center also administers summer programs in Brazil and Mexico.

For further information on the Center's programs and activities, please contact the Director of the Center for Latin American Studies, 319 Grinter Hall.

The Organization for Tropical Studies (OTS) is a consortium of 52 major educational and research institutions in the United States and abroad, created to promote understanding of tropical environments and their intelligent use by people. The University of Florida is a charter member. Graduate field courses in tropical biology and ecology, agricultural ecology, population biology, and forestry are offered in Costa Rica during the spring and summer terms. Students are selected on a competitive basis from all OTS member institutions.

A University of Florida graduate student may register for eight credits in an appropriate departmental course cross-listed with OTS, e.g., BOT 6951 or PCB 6357C. The University of Florida does not require tuition for OTS courses. Registration is on the host campus. However, students on Graduate Assistantships must be registered at the University of Florida as well. Research grants are available through OTS. Further information may be obtained from University of Florida representatives to the OTS board of directors, located in 422 Carr Hall and 3028 McCarty Hall.

The Center for Tropical Agriculture, within the Institute of Food and Agricultural Sciences, seeks to stimulate interest in research and curriculum related to the tropical environment and its development.

Research.—International agricultural development assistance contracts frequently have research components. The Center assists in the coordination of this research.

Minor in Tropical Agriculture.—An interdisciplinary minor in tropical agriculture is available at both the master's and doctoral levels for students majoring in agriculture, forestry, and other fields where knowledge of the tropics is relevant. The minor may include courses treating specific aspects of the tropics such as natural resource management (e.g., soils, water, biodiversity), climate, agricultural production, and the languages and cultures of those who live in tropical countries.

Certificate in Tropical Agriculture (CTA).—A program emphasizing breadth in topics relevant to tropical agriculture (with certificate) for graduate students is available through the College of Agriculture. The CTA is designed to prepare students for work in situations requiring knowledge of both the biological and social aspects of tropical agriculture. Students entering the program will receive guidance from members of the CTA Steering Committee regarding course work and language preparation appropriate for careers in international agricultural development.

The CTA requires a *minimum* of 12 credit hours. The "typical" certificate program will consist of 12 to 24 credits. These hours may, with approval from supervisory committees, also count toward the M.S. or Ph.D. Students in the CTA program are required to demonstrate proficiency in a language spoken in the tropics. A score on the Foreign Service Institute (FSI) Language Examination of 2.0 or higher, or a comparable score on a similar examination (if taken within two years of admission to the CTA program) will fulfill the language requirement. Otherwise, an internal language examination will be administered sometime during the CTA program for each individual student. No specific language is required; however Spanish, French, or Portuguese is suggested. While experience in a foreign country is strongly encouraged, it is not a requisite for the CTA.

Application brochures are available from the Office of the Dean for Academic Programs (College of Agriculture), 2014 McCarty Hall.

Other Activities.—The Center seeks a broad dissemination of knowledge about tropical agriculture through the sponsoring of conferences, short courses, and seminars featuring leading authorities on the tropics; publication of books, monographs, and proceedings; and through acquisition of materials for the library and the data bank.

The Certificate in Women in Development (CWID) is a program for graduate students in the Colleges of Liberal Arts and Sciences and Agriculture. The CWID requires a minimum of 12 credit hours that may also count toward the master's or Ph.D. degree. Students from all academic backgrounds are encouraged to consider the CWID. The Women in Agriculture Development program (WIAD) and the Women's Studies Program will advise students concerning appropriate courses. Applications procedures are available from the WIAD Cocoordinators, Dr. Peter Hildebrand, 2126 McCarty Hall, and Dr. Sandra Russo, 123 Tigert Hall, and from Dr. Helga Kraft, Director of Women's Studies, 8 Anderson Hall.

BIOLOGICAL SCIENCES

The University of Florida Marine Laboratory at Seahorse Key is located 57 miles west of Gainesville on the Gulf Coast, 3 miles offshore, opposite Cedar Key. Facilities include a 20x40-foot research and teaching building and a 10-room residence, with 2 kitchens and a dining-lounge, which provides dormitory accommodations for 24 persons. The Laboratory, which owns a 32-foot research vessel equipped for offshore work and several smaller outboard-powered boats for shallow water and inshore work, is used for research by graduate students from the various departments of the University.

The Center for Sea Turtle Research conducts research on all aspects of the biology of sea turtles. Researchers at the Center, in collaboration with students and faculty of various departments, take an interdisciplinary approach to address the complex problems of sea turtle biology and conservation. Scientists from the Center have investigated questions of sea turtle biology around the world. Long-term field studies of the Center are primarily conducted at two research stations in Costa Rica and the Bahamas. Reproductive biology of green turtles is studied at Tortuguero, Costa Rica, the site of the largest nesting colony of green turtles in the Atlantic. Studies on the biology of three species of sea turtles are conducted at a natural feeding area on Great Inagua, Bahamas. For further information, contact the Director, Center for Sea Turtle Research, 223 Bartram.

The Whitney Laboratory (WL) is the institute for marine biomedical research and biotechnology of the University of Florida. Since its founding in 1974, the Whitney Laboratory, near St. Augustine, has been dedicated to the use of marine organisms for solving fundamental problems in experimental marine biology.

The academic staff of the Laboratory consists of 10 permanent faculty members, with 30 to 40 associates, students, and visiting scientists. Dr. Michael J. Greenberg has been the Director since 1981.

Fields of research at the WL include chemosensory and visual physiology and biochemistry, synaptology, developmental and cell biology, molecular biology, toxicology, and peptide pharmacology. Research animals range phylogenetically from jellyfish to aquatic vertebrates. The common theme unifying this diversity is a focus on communication between cells and tissues, i.e., the interactions of cell membranes with signaling molecules.

Research at the Whitney Laboratory attracts graduate students and visiting scientists from across the U.S. and from abroad. Students enroll in the graduate programs of the Departments of Anatomy and Cell Biology, Fisheries and Aquatic Sciences, Neuroscience, Pharmacology and Therapeutics, Physiology, or Zoology. Their course work (in Gainesville) and their dissertation research (at the Whitney Lab) are guided by scientists from the WL who are graduate faculty members of University of Florida teaching departments. An undergraduate research training program at the Laboratory is sponsored by both private and governmental agencies.

The Laboratory is situated on a narrow barrier island, with both the Atlantic Ocean and the Intercoastal Waterway within a few hundred feet of the facility. The campus is in the town of Marineland, about 18 miles south of St. Augustine, and 80 miles east of Gainesville.

For further information, write the Scientific Director, Whitney Laboratory, 9505 Ocean Shore Blvd., St. Augustine, FL 32086-8623, telephone (904) 461-4000, FAX 461-4008.

AGROFORESTRY

The agroforestry interdisciplinary specialization is administered through the Department of Forestry, in the School of Forest Resources and Conservation. It offers facilities for interdisciplinary graduate education (M.S., Ph.D.) by combining course work and research around a thematic field focusing on agroforestry, especially in the context of tropical land use. Students seeking admission to the specialization should have a degree in one of the relevant fields such as agronomy, forestry, horticulture, soil science, or social sciences. They should apply to the School of Forest Resources and Conservation or another department that closely represents their background and interest. Students have the flexibility to plan their course work, with focus on agroforestry, out of a wide range of courses from several related disciplines. Thesis research can be undertaken in Florida or overseas. Degrees will be awarded through the departments in which the candidates are enrolled.

In conjunction with the graduate degree, a student can earn a specialization or minor in agroforestry by fulfilling certain requirements. Students who have a primary interest

in agroforestry and undertake graduate research on an agroforestry topic can seek the specialization. Those who have an active interest and some training in agroforestry, but do not conduct graduate research on an agroforestry topic, can earn a minor. Candidates who fulfill the applicable requirements can have their transcripts inscribed, upon request, with the citation **Specialization in Agroforestry** or **Minor in Agroforestry**.

Requirements for either option include completion of FNR 5335-Agroforestry and a relevant number of approved supporting courses. These courses should be distributed over at least two departments other than the candidate's major department to provide the student with the background necessary to function in multidisciplinary teams and in association with professionals from other disciplines. Individuals with a strong biological background are encouraged to take courses in the social sciences, and vice versa.

Candidates for the specialization or minor in agroforestry should include on the graduate committees at least one faculty member representing the agroforestry interest. This faculty member, as designated by the Agroforestry Program Advisory Committee, will counsel the student on the selection of courses and the research topic.

Further information may be obtained from the Agroforestry Program Leader at 118 Newins-Ziegler Hall; (904) 392-4851.

CENTER FOR CHEMICAL PHYSICS

The Center, with the participation of the faculty of the Departments of Chemistry, Physics, and Chemical Engineering, is concerned with graduate education and research in the theoretical, experimental, and computational aspects of problems in the borderline between chemistry and physics. Graduate students join one of the above departments and follow a special curriculum. The student receives, in addition to the Ph.D. degree, a Certificate in Chemical Physics. For information, contact the Director, Williamson Hall.

CENTER FOR GERONTOLOGICAL STUDIES

Through the Center for Gerontological Studies, students and faculty from diverse disciplines may study or conduct research in gerontology.

Programs are developed both within and outside the University to benefit older persons and to develop career-related experiences for graduate and professional students. The Center for Gerontological Studies offers the Graduate Certificate in Gerontology for master's, specialist, and doctoral students in conjunction with graduate programs in a variety of disciplines and professions. Certificate requirements include a minimum of 12 hours in approved gerontology courses and an approved interdisciplinary research project in gerontology or a topic related to geriatrics. A limited number of graduate assistantships for students accepted into the Graduate Certificate in Gerontology program are available from the Center.

The Center disseminates information derived from research on gerontology-related aspects of anthropology, architecture, biology, economics, education, geography, health administration, humanities, law, medicine, nursing, nutrition, occupational therapy, psychology, recreation, sociology, and other fields. Courses in gerontology are available in the above areas.

The Center sponsors special conferences on gerontology and several in-service training workshops and seminars for academic and continuing education credit.

For information about the Center's Graduate Certificate Program, write the Director, Center for Gerontological Studies, 3355 Turlington Hall.

HEALTH PHYSICS AND MEDICAL PHYSICS

Two allied interdisciplinary options, health physics and medical physics, are offered as a cooperative effort of the Departments of Environmental Engineering Sciences and Nuclear Engineering Sciences, College of Engineering, and the College of Medicine. Degrees are granted by the College of Engineering and include Master of Science, Master of Engineering, Engineer, and Doctor of Philosophy.

Health Physics is the science devoted to protecting man and the environment from the harmful effects of radiation while advancing its beneficial use. Students may seek admission to either the Department of Environmental Engineering Sciences or the Department of Nuclear Engineering Sciences. The study program includes departmental requirements, common health physics courses, and electives to meet a particular emphasis. Opportunities for research and practical training are available through cooperation with departments in the health sciences, with the University's Division of Environmental Health and Safety, and with industry. The University of Florida is approved for participation in a variety of Department of Energy Fellowship Programs, including health physics, radioactive waste, and environmental restoration. Prospective students are eligible for National Academy of Nuclear Training fellowships, Health Physics Society fellowships, and numerous research supported assistantships. For additional information contact either the Department of Environmental Engineering Sciences or the Department of Nuclear Engineering Sciences.

Medical Physics is concerned with the applications of physical energy concepts and methods to the diagnosis and treatment of human disease. Students enroll in the Department of Nuclear Engineering Sciences. Students interested in the radiation protection aspects of the application of radioactivity or radiation in the healing arts may enroll in either the Department of Environmental Engineering Sciences or the Department of Nuclear Engineering Sciences in the health physics option. Formal courses include department core requirements, a radiation biology course, a block of medical physics courses taught by Nuclear Engineering Sciences, Radiology, and Radiation Oncology faculty, and one or more health physics courses. In addition, the program includes clinical internships in the Departments of Radiology and Radiation Oncology. Research opportunities and financial support exist in the form of faculty research and projects related to patient care.

HYDROLOGIC SCIENCES

Interdisciplinary graduate studies in hydrologic sciences are designed for science and engineering students who are seeking advanced training in diverse aspects of water quantity, water quality, and water use issues. The emphasis is on providing (1) a thorough understanding of the physical, chemical, and biological processes occurring over broad spatial and temporal scales; and (2) the skills in hydrologic policy and management based on a strong background in natural and social sciences and engineering.

Graduate faculty from eight departments in three colleges contribute to this interdisciplinary specialization. Depending on academic background and research interests, students may opt to receive the graduate degree in any one of the following departments: Agricultural Engineering, Civil Engineering, Environmental Engineering Sciences, Forest Resources and Conservation, Food and Resource Economics, Geography, Geology, and Soil and Water Science.

M.S. (thesis and nonthesis option) and Ph.D. studies are available. The interdisciplinary graduate requirements were developed recognizing the diversity in the academic backgrounds and professional goals of the students. A core curriculum (12 credits for M.S.; 18 credits for Ph.D.) provides broad training in five topics: hydrologic systems, hydrologic chemistry, hydrologic biology, hydrologic techniques and analysis, and hydrologic policy and management. Additional elective courses (11 to 14 credits for M.S.; 30 credits for Ph.D.) allow specialization in one or more of these topics. Research projects involving facutly from several departments can provide the basis for thesis and dissertation research topics.

Assistantships and a limited number of fellowships supported by grants from federal agencies and matching state funds are available. Tuition waivers may be available to students who qualify. Students with B.S. or M.S. degrees in any of the following disciplines are encouraged to consider this specialization within their graduate programs: engineering (agricultural, chemical, civil, environmental); natural sciences (physics, biology, chemistry); social sciences (agricultural and resource economics); forestry; earth sciences (geography, geology, soil and water science).

For more information, contact Professor Suresh Rao, 2169 McCarty Hall, P.O. Box 110290, telephone (904) 392-1951.

PUBLIC ADMINISTRATION

A complete description of the curriculum in public administration is included in the departmental listing for Political Science.

QUANTUM THEORY PROJECT (QTP)

Faculty from the Departments of Chemistry and Physics participate in QTP, officially the **Institute for Theory and Computation in Molecular and Materials Sciences**. The Institute is concerned with graduate education and research in the theory of the electronic structure, spectroscopy, and dynamical processes of molecules and materials. This area of research intersects large areas of modern chemistry, physics, molecular biology, and materials sciences, and uses large scale computing as an essential tool for precise numerical solution of complex dynamical equations, for novel graphical display, and for simulation studies.

Graduate students in chemistry and physics are eligible for this specialization and follow a special curriculum. For information contact the Director, Williamson Hall.

TOXICOLOGY

The Center for Environmental and Human Toxicology serves as the focal point for activities concerning the effects of chemicals on human and animal health. The Center's affiliated faculty is composed of approximately 20 to 30 scientists and clinicians, interested in elucidating the mechanisms of chemical-induced toxicity, and is drawn from the Colleges of Medicine, Veterinary Medicine, and Pharmacy, and the Institute of Food and Agricultural Sciences. The broadly based, interdisciplinary expertise provided by this faculty is also used to address complex issues related to the protection of public health and the environment.

Students who wish to receive graduate training in interdisciplinary toxicology leading to a Ph.D. enroll through one of the participating graduate programs, such as Pharmacology and Therapeutics, Pathology and Laboratory Medicine, Animal Science, Medicinal Chemistry, Veterinary Medical Sciences, or Food Science and Human Nutrition. The number of graduate programs involved in interdisciplinary toxicology, as well as the variety of perspectives provided by their disciplines, allows a great deal of flexibility in providing a plan of graduate study to meet an individual student's interests and goals in toxicology. Student course work and dissertation research are guided by the Center's researchers and affiliated faculty who are also members of the graduate faculty of the student's major department. Dissertation research may be conducted either in the student's department, or at the Toxicology Laboratory facilities located at the Center. For additional information, please write to the Director, Center for Environmental and Human Toxicology, 1 Progress Blvd., Box 17, Alachua, FL 32615.

WOMEN'S STUDIES

The Women's Studies Program offers the Graduate Certificate in Women's Studies which is designed to supplement a student's degree program in another discipline. The Certificate requires a minimum of 12 credit hours, including a core requirement consisting of 6 credit hours of women's studies courses which provide an integrative and inter disciplinary intellectual encounter with the contributions and challenges of feminist inquiry. The remaining 6 credits are chosen, in consultation with the women's studies graduate committee, from courses that support the student's specialty.

Graduate students are expected to develop a thorough grounding in the new scholarship on women; to acquire an understanding of gender as a category of analysis; to analyze and assess theories about the role of gender in systems of hierarchy and its intersections with other categories of difference, such as race, ethnicity, religion, class, sexuality, physical and mental ability, and age; and to acquire an understanding of the challenges posed by the new scholarship on women.

RESEARCH ORGANIZATIONS

FLORIDA AGRICULTURAL EXPERIMENT STATION

The Florida Agricultural Experiment Station conducts a statewide program in agriculture, natural resources, and the environment. Research deals with agricultural production, processing, marketing, human nutrition, veterinary medicine, renewable natural resources, and environmental is-

sues. This research program includes activities by departments located on the Gainesville campus as well as on the campuses of Research and Education Centers and Agricultural Research and Education Centers throughout the state. Close cooperation with numerous Florida agricultural and natural resource related agencies and organizations is maintained to provide research support for Florida's broad variety of crops, commodities, and natural resources.

The Land-Grant philosophy of research, extension, and teaching is strongly supported and administered by the Vice President for Agriculture and Natural Resources. The Institute of Food and Agricultural Sciences, under his leadership, comprises the Florida Agricultural Experiment Station, the Cooperative Extension Service, the College of Agriculture, and the College of Veterinary Medicine, each functioning under a dean. Many of the IFAS faculty have joint appointments between areas.

Funds for graduate assistants are made available to encourage graduate training and professional scientific improvement.

Research at the main station is conducted within 21 departments—Agricultural Engineering, Agricultural Education and Communication, Agronomy, Animal Science, Dairy Science, Entomology and Nematology, Food and Resource Economics, Food Science and Human Nutrition, Fisheries and Aquatic Sciences, Forestry, 4-H and Other Youth Programs, Home Economics, Horticultural Sciences, Microbiology and Cell Science, Environmental Horticulture, Plant Pathology, Poultry Science, Soil and Water Science, Statistics, Veterinary Medicine, and Wildlife and Range Sciences. In addition to the above, there are additional units vital to research programs, namely, Educational Media and Services, Facilities Operations, Planning and Business Affairs, Sponsored Programs, Personnel, and Federal Affairs.

The locations of the Research and Education Centers are Belle Glade, Bradenton, Fort Lauderdale, Homestead, Lake Alfred, Quincy, Sanford, Monticello, Brooksville, Fort Pierce, Immokalee, Dover, Hastings, Ona, Apopka, Marianna, Live Oak, Leesburg, Vero Beach, and Jay. A Center for Cooperative Agricultural Programs (CCAP) in Tallahassee is jointly supported with Florida A&M University.

The Florida Agricultural Experiment Station is cooperating with the Brooksville Subtropical Research Station, Brooksville, a USDA field laboratory, in its beef cattle and pasture production and management programs and with the National Weather Service, Ruskin, in the agricultural weather service for Florida.

In addition to the above, research is conducted through the IFAS International Programs Office, the Centers for Natural Resources Programs and for Biomass Energy Systems, the Center for Environmental Toxicology, and the Center for Aquatic Plants.

DIVISION OF SPONSORED RESEARCH

The Division of Sponsored Research (DSR) has two general functions: (1) the promotion and administration of the sponsored research program and (2) the support of the total research program of the University for maximum benefit to the University and the greatest service to the State of Florida. DSR seeks to stimulate the growth of research and to expand balanced research efforts throughout the University. These activities directly support the graduate program.

Policies and procedures of DSR are developed by a Board of Directors working with the Vice President for Research within the administrative policies and procedures of the University. The Graduate Council serves as adviser on scientific matters and on issues relating to the graduate program.

All research, grant-in-aid, training, or educational service agreement proposals must have the approval of the Vice President for Research before submission. Subsequent negotiations of sponsored awards are executed under the Vice President's supervision. DSR's management of proposal processing and award administration relieves principal investigators and departments of many of the detailed administrative and reporting duties connected with sponsored research. DSR also assists researchers in finding sponsors for their projects and disseminates program information, research policies and regulations, and proposal deadlines throughout the University.

The law establishing the Division of Sponsored Research enables the use of some recovered indirect cost funds to support innovative research. The DSR Board of Directors has the responsibility for the award of these Internal Support Program funds to eligible faculty. For information, write the Vice President for Research, Division of Sponsored Research, 223 Grinter Hall, P.O. Box 115500.

FLORIDA ENGINEERING AND INDUSTRIAL EXPERIMENT STATION

The Florida Engineering and Industrial Experiment Station (EIES) developed from early research activities of the engineering faculty and was officially established in 1941 by the Legislature as an integral part of the College of Engineering. Its primary purposes are to perform research which benefits the state's industries, health, welfare, and public services; to help enhance the national competitive posture through the development of new materials, devices, and processes; and to enhance the undergraduate and graduate engineering education of students by providing them with the significant opportunity of participating in hands-on, state-of-the-art research experiences.

The EIES—the research arm of the College—is well recognized nationally and internationally for the quality and breadth of its programs. These span the realms of outer space, the oceans and the earth, and include topics such as materials; intelligent machines; process systems; computer technologies and systems; construction and manufacturing technologies; mechanical, electrical, and structural designs; robotics; computer-aided design and manufacturing; energy systems; and a broad spectrum of research related to the "public sector," i.e., agricultural, civil, coastal, and environmental engineering.

INSTITUTE FOR ADVANCED STUDY OF THE COMMUNICATION PROCESSES

The Institute for Advanced Study of the Communication Processes (IASCP) provides opportunities for University faculty and advanced students to carry out research in the communication processes. The Institute is interdisciplinary, with membership drawn from the Colleges of Liberal Arts and Sciences, Engineering, Medicine, Dentistry, Education, and Fine Arts. The University of Florida in Gainesville is its headquarters, but it is structured to serve the entire State University System. Currently there are active participants from Florida State University, the University of South Florida, the University of Miami, and Florida International University. The IASCP faculty also includes members located at other universities and research laboratories both within the continental United States and abroad.

The overall objective of IASCP is the maintenance of a scientific center of excellence focused on human commu-

nicative behavior. The Institute's program includes (but is not confined to) three broad areas: 1) the communicator(s), i.e., the physiological/physical/psychological processes by which individuals generate and transmit communicative signals (speech), 2) the respondent(s), and how receptive (hearing) and neural mechanisms function to process signals within a variety of environments, and 3) the message, i.e., the codes and signs (language) that constitute the sum total of these communicative messages. The IASCP faculty includes students and scientists with a variety of interests and training. Expertise is represented by the phonetic sciences, speech pathology and audiology, psychology, psycholinguistics, linguistics, anthropology, psychoacoustics, auditory neurophysiology, electrical engineering, computer sciences, physics, communication studies, bilingual communication, biocommunication, dentistry, and medicine.

As stated, IASCP's overall research effort is basically an interdisciplinary one, but the focus of each investigator's interests is the advancement of knowledge about human communication. For information, write the Director, Institute for Advanced Study of the Communication Processes, 63 Dauer Hall.

INTERDISCIPLINARY RESEARCH CENTERS

CENTER FOR ACCOUNTING RESEARCH AND PROFESSIONAL EDUCATION

CARPE was established in 1993 as an integral part of the Fisher School of Accounting and the College of Business Administration. Its mission is twofold: to promote a scholarly environment for research on relevant issues in accounting and to offer quality professional education programs in accounting and business. CARPE is responsible for accounting research seminars, academic conferences, a working paper series, and the publication of the *Journal of Accounting Literature*. The Center holds several conferences each year on issues of national interest to professional and business communities, and coordinates faculty participation in professional education. For more information, write the Director, Center for Accounting Research and Professional Education, 211 Business Building.

CENTER FOR AERONOMY AND OTHER ATMOSPHERIC SCIENCES

The Center (ICAAS) is a community of scholars drawn from many disciplines represented at the University of Florida who are seeking solutions to problems related to anthropogenic emissions to the atmosphere. Pollution prevention was the central approach chosen in a broad interdisciplinary effort initiated by ICAAS in 1970. In effect, its purpose was to transfer successful industrial and military experience with preventative maintenance into the environmental arena. Faculty members from societal, medical, engineering, and atmospheric science disciplines have been associated with ICAAS.

The first major interdisciplinary study, initiated in 1972, was on determining the biological impacts of stratospheric ozone depletion. The next major interdisciplinary study was a coal burning issues project awarded in 1979 to explore options to wean Florida from its excessive reliance on imported oil without increasing emission of pollutants or greenhouse gases. Research on co-combustion of coal and natural gas for oil backout and pollution prevention evolved in 1981 from this effort. In 1985 an industrial scale boiler at Tacachale, an institution in Gainesville for developmentally disabled persons, was made available for co-combustion studies. The following year the Center acquired by donation an institutional incinerator that has subsequently been used for a number of multifuel combustion and toxic minimization studies.

Studies at Tacachale (an Indian word meaning to build a better fire) strongly support the use of "green technologies" or "cradle to grave" environmental perspectives in conjunction with clean combustion technologies. This work has led to the formation of the Clean Combustion Technology Laboratory (CCTL) with the auspices of the Department of Mechanical Engineering. More recently, ICAAS, CCTL, and the Fire Research and Test Center of the Rinker School of Building Construction have embarked upon a program of fire protection research to find replacements for halon fire suppressants.

For further information on these and other research programs that address anthropogenic emission problems, write the Director, Professor A.E.S. Green, ICAAS Space Sciences Research Building.

CENTER FOR APPLIED MATHEMATICS

The Center consists of faculty from the Departments of Aerospace Engineering, Mechanics, and Engineering Science and of Mathematics. These faculty are interested in the application of mathematics to research problems in the physical, engineering, social, and biological sciences. Codirectors are Professors A.R. Bednarek and U. Kurzweg.

CENTER FOR AQUATIC PLANTS

The Center for Aquatic Plants is a multidisciplinary unit of the Institute of Food and Agricultural Sciences (IFAS). Established in 1978 by the Florida Legislature, the Center is the lead agency for coordinating research and educational programs on aquatic plant ecology and management in Florida. The Center is also involved in national and international research and education programs. The Center encourages interdisciplinary research focused on biological, chemical, mechanical, and integrated aquatic plant management techniques and their impact on aquatic ecosystems. Scientists associated with the Center specialize in aquatic plant ecology, plant pathology, entomology, phycology, physiology, fisheries, weed science, and limnology. Faculty and graduate students are associated with their respective departments in IFAS. Interested persons should write the Director, Center for Aquatic Plants, 7922 NW 71st Street, Gainesville, FL 32606.

BRECHNER CENTER FOR FREEDOM OF INFORMATION

The Center, an endowed division within the College of Journalism and Communications, sponsors research, symposia about media law issues, and an annual national competition for excellence in reporting about the First Amendment, government-held records, or government-in-the-sunshine. The competition award winner receives $3,000. The Center also serves as an information clearinghouse for developments in mass media law in the state of Florida. It publishes the *Brechner Report*, a monthly media law newsletter, 10 times a year.

The Joseph L. Brechner Eminent Scholar in Freedom of Information heads the Center and advises students in a joint degree program leading to the Juris Doctor and the Master of Arts in Mass Communication. The Center offers research and editorial assistantships to doctoral students.

The Center opened in 1977 as the Florida Freedom of Information Clearing House. Its title was changed in 1988.

CENTER FOR BUSINESS ETHICS EDUCATION AND RESEARCH

The Center for Business Ethics Education and Research was established in 1990 to increase dissemination of the knowledge of ethics theory and the application and practice of such theory as it relates to the institution of business administration in a dynamic society. The objectives of the Center are (1) to contribute to providing the foundation for competent, responsible participation in business, the professions, and government; (2) to contribute to stimulating interest in social, economic and civic responsibility; (3) to contribute to development of ethical competence in making business decisions and in evaluating business policy; (4) to contribute to furthering the teaching, research, and service mission of the College of Business Administration.

For information, write the Director, Center for Business Ethics Education and Research, 109 Bryan Hall.

CLINICAL RESEARCH CENTER

The Center, part of the Shands Teaching Hospital, provides a carefully controlled medical research environment in which scientists can define and attempt to conquer unsolved disease problems affecting humans.

A discrete unit, funded entirely through a grant by the National Institutes of Health (NIH), the Center is administered through the College of Medicine of the University of Florida. The grant provides for a metabolic kitchen and its staff, a laboratory and staff, nursing and administrative personnel. The NIH provide coverage of all research charges for patient care and also support an out-patient function for the Center.

For information write Clinical Research Center, Box 100322, Health Science Center.

COMMUNICATION RESEARCH CENTER

The Center, a service and research unit within the College of Journalism and Communications, conducts basic and applied research on problems related to mass communication. Both master's and doctoral students work as assistants on these projects. The Center provides consultation and assistance to faculty within the College and across the University and to individuals and organizations throughout the state. The Center has a computer-assisted interviewing system and conducts telephone polls, personal interviews, focus groups, media use and effects studies, and message-testing research.

The overall objectives of the Center are to assist College faculty with obtaining funding for basic research and to train mass communication graduate students in both applied and basic research. The Center seeks research projects that help meet these goals. For information, write the Director, Communication Research Center, 2000 Weimer Hall.

CENTER FOR CONSUMER RESEARCH

The Center conducts basic and applied research on factors influencing consumer decision-making and behavior. It provides an organization through which faculty members from a number of disciplines may effectively work together to study the interface between consumers, private organizations, and policy alternatives. The Center sponsors a colloquium series involving both University of Florida faculty and students and scholars from around the country as well as a working paper and reprint series. For information, write the Director, Center for Consumer Research, 208 Bryan Hall.

CENTER FOR DYNAMIC PLASTICITY

The Center conducts research and educational programs and disseminates information on the behavior of materials at high rates of deformation. In addition to structural materials (such as metals, polymers, and composites), the Center is concerned with biological materials (bones and soft tissues) and with dynamic soil mechanics. The Center has established a cooperative arrangement with the University of Bucharest to enhance international cooperation and exchange of information and personnel. For information, write the Director, Center for Dynamic Plasticity, 231 Aero Building.

BUREAU OF ECONOMIC AND BUSINESS RESEARCH

The Bureau is a service and research center within the College of Business Administration. Its activities are organized under four research programs: population, economic forecasting, survey, and policy studies. Graduate students are involved as research assistants in these programs.

The Bureau disseminates the results of its research through a publication program. Bureau publications include *Florida Statistical Abstract, BEBR Monographs, The Florida Outlook, Populations Studies, Florida Estimates of Population, Economic Leaflets, Building Permit Activity in Florida,* and *Sales Tax Information.* For information, write the Director, Bureau of Economic and Business Research, 221 Matherly Hall.

CENTER FOR EXERCISE SCIENCE

This interdisciplinary Center conducts research related to (1) the immediate and lasting effects of physical activity; (2) the acquisition, control, and efficiency of human movement; and (3) the effects of aging and disorders, such as cardiovascular disease, low back pain, stress, and weight control, on human performance. Center researchers study various groups and individuals from the handicapped to the gifted athlete.

The Center is a research unit of the Colleges of Health and Human Performance and Medicine with affiliated faculty from the Division of Cardiology and Departments of Physiology, Physical Therapy, Orthopedics, and Gerontology at the VA Medical Center. It occupies 7000 square feet of space in Florida Gymnasium. For further information write the Director, Center for Exercise Science, Florida Gymnasium, 392-9575.

FINANCIAL INSTITUTIONS CENTER

The Financial Institutions Center conducts research on management and public policy issues regarding financial intermediaries. Major emphasis is placed on analysis of the impact of the economic and regulatory environment on the financial sector.

The Center sponsors research studies by faculty and graduate students, sponsors doctoral dissertations, and conducts frequent seminars. For additional information, write the Director, Financial Institutions Center, 327 Business Building.

FLORIDA ARCHITECTURE AND BUILDING RESEARCH COUNCIL

As the research arm of the College of Architecture, the Council promotes, encourages, and coordinates research activities among the College's 11 centers, institutes, and laboratories and within its 5 academic disciplines: architecture, building construction, urban and regional planning, landscape architecture, and interior design. Principal current research interests of the Council include architectural acoustical modeling, alternative conflict management, computer resource mapping, central city redevelopment, architectural preservation, and construction management. The Council maintains cooperative contacts with other departments on campus and with institutions within the United States, Latin America, and the Caribbean Basin. For information, write the Director, Florida Architecture and Building Research Council, 331 Architecture Building.

FLORIDA INSURANCE RESEARCH CENTER

The Florida Insurance Research Center (FIRC) focuses on the effects of economic and regulatory issues on both the Florida and the national insurance market. In this regard, scholarly research is conducted on insurance company operations as well as the needs of insurance consumers. The Center also supports students through annual scholarships.

Management of the Center is by its director, and faculty from other colleges in the University are utilized as the need arises. For information write the Director, Florida Insurance Research Center, 329 Business Building.

CENTER FOR HEALTH POLICY RESEARCH

The Center conducts and facilitates collaborative interdisciplinary studies focusing on issues relating to policies which affect the manner in which health care services are delivered, funded, administered, or regulated. Faculty and students from a broad spectrum of disciplines are encouraged through the Center to participate in organized research activities funded through governmental or philanthropic sources.

A goal of the Center is to develop and maintain data bases and models which can be utilized to assist in the analysis of existing and proposed policy alternatives under a variety of potential future scenarios. Research and analyses are guided by the principle that better health care legislation and more effective and efficient health services delivery will result from anticipating the legal, administrative, economic, social, and ethical consequences of health policy changes. For information, write the Director, Center for Health Policy Research, Box 100177, Health Science Center.

INSTITUTE OF HIGHER EDUCATION

The Institute of Higher Education is an agency within the College of Education, responsible at the same time to the Vice President for Academic Affairs, and is defined as a research and service agency of the University focused upon higher education. Operating under the Institute are several organizational structures: The Florida Community College Interinstitutional Research Council, a consortium of community colleges in Florida with focus upon institutional and system-wide research; the Community College Leadership Progam with a focus on developing and improving administrative leadership in community colleges; the State Leadership Program in Higher Education, a partnership program with Florida State University, for preparing and improving state agency staff personnel; and special projects of both research and service orientation which are assigned from time to time, often on a contract basis.

Many advanced graduate students find research projects of their own interests among the many activities of the IHE. For information, write the Director, Institute of Higher Education, 2403 Norman Hall.

HUMAN RESOURCE RESEARCH CENTER

The Human Resource Research Center conducts research on the application of behavioral science to the management of human resources. It studies factors that affect individual and organizational performance in ways that have practical implications for management. Thus, the Center's goal is to contribute to both the science and the profession of human resource management. It conducts research that leads to a better understanding of principles governing individual work behavior and organizational processes, and it develops and evaluates policies, procedures, and programs designed to promote human fulfillment and effectiveness at the work place. For information, write the Director, Human Resource Research Center, 201 Business Building.

CENTER FOR INTERNATIONAL ECONOMICS AND BUSINESS STUDIES

The Center has three missions within the College of Business Administration. It is the organization within the College responsible for administering all linkage arrangements and managing exchange programs with international partner institutions. These include both student and faculty exchange programs, study abroad programs, and foreign assistance programs supported by various grants and private funding sources. Also, the Center is responsible for coordinating recruitment activities and counseling of College of Business Administration students for participation in overseas programs and for working with the University's Office of International Studies and Programs to ensure that administrative requirements are met. Finally, the Center conducts basic and applied research on topics relating to the global economic and business environment. It explores how corporations, governments, supranational institutions, such as the World Bank, and individuals interact in a global context. For more information, write the Director, Center for International Economics and Business Studies, 110 Bryan Hall.

CENTER FOR MACROMOLECULAR SCIENCE AND ENGINEERING

The Center is developing unified research and teaching programs, drawing its members from the Departments of Chemistry, Materials Science and Engineering, Chemical Engineering, Biochemistry, and Physics. Current research includes synthetic polymer chemistry, mechanism of polymerization studies, solution and solid state properties of polymers, biological applications of polymers, and limited studies on industrial applications of polymers. For information, write the Director, Center for Macromolecular Science and Engineering, 414 Space Sciences Research Building.

CENTER FOR MATHEMATICAL SYSTEM THEORY

The Center was established in 1972 to advance research in all areas of system theory dependent on mathematical methodology. Both pure and applied problems are emphasized. The Center is operated on an interdisciplinary basis in cooperation with the Departments of Mathematics, Electrical Engineering, Industrial and Systems Engineering, Statistics, and Aerospace Engineering, Mechanics, and Engineering Science.

The permanent faculty of the Center presently includes Professors R.E. Kalman (Director), G. Basile, J. Hammer, V.M. Popov, and T.E. Bullock. There are numerous affiliated faculty and many visitors of international stature. An active research seminar is conducted throughout the year on recent developments in system theory, as well as certain aspects of computer science and econometrics.

One of the principal current research areas of the Center is the identification of linear relations and systems from noisy data. Another principal research area of the Center is the mathematical theory of nonlinear systems, including the theory of control of nonlinear systems, the robust stabilization of nonlinear systems, and the theory of adaptive control of nonlinear systems. The Center also conducts research in the area of algebraic theory of linear control, including realization theory, partial realization theory, stabilization and control of linear time-invariant and linear time-varying systems, linear delay-differential systems, and adaptive control of linear systems.

MINERAL RESOURCES RESEARCH CENTER

To meet the future demand for mineral and material resources, both the federal and the state governments have committed themselves to developing the necessary technology for processing of low grade complex ores and other raw materials. As a result, an interdisciplinary Mineral Resources Research Center was established in the College of Engineering under the jurisdiction of the Department of Materials Science and Engineering. The research activities of the Center are an educational program in mineral and particulate processing. The major objective of these twin activities is to investigate specific problems through application of basic scientific principles and to provide the skilled personnel needed by industries. The current emphasis in research is on processing of low grade ores, fine particle processing, environmental control and restoration, applied surface and colloid chemistry, and hydrometallurgy. These programs are truly interdisciplinary and involve scientists and engineers from such additional departments as Chemical Engineering, Environmental Engineering Sciences, Soil and Water Science, Geology, and Chemistry. For further information write Dr. Brij M. Moudgil, Director, Mineral Resources Research Center, 161 Rhines Hall.

CENTER FOR NEUROBIOLOGICAL SCIENCES

The purpose of the Center is to promote intellectual interchange and scientific collaboration among faculty and students interested in the nervous system. A training grant supports students specifically involved in the investigation of brain-behavior relationships. The training program is conducted through formal courses, seminars, symposia, and participation in laboratory research. Trainees are affiliated with the Center through a basic science or clinical department. For information, write the Director, Center for Neurobiological Sciences, Box 100244, J. Hillis Miller Health Science Center.

CENTER FOR NUTRITIONAL SCIENCES

The purpose of the Center is to provide a focal point for coordination of nutrition activities involving instruction, research, and service. A graduate training program is conducted through a recommended core curriculum in nutritional science in conjunction with ancillary courses as suggested by supervisory committees derived from Center faculty and participating departments. Center faculty for research and teaching are drawn from departments in the Institute of Food and Agricultural Sciences, colleges in the J. Hillis Miller Health Science Center, and the College of Liberal Arts and Sciences. The Center sponsors seminars, symposia, and visiting professorships in the full spectrum of activity that encompasses nutritional science, and occasionally has a limited number of graduate Fellowships. For information, write Dr. Robert J. Cousins, Director, Center for Nutritional Sciences, 201 Food Science and Human Nutrition Building, P.O. Box 110370.

PUBLIC POLICY RESEARCH CENTER

The Public Policy Research Center (PPRC) at the University of Florida was established in 1975 to support scholarly research, seminars, and conferences on government involvement in the private sector of the market, including direct and indirect regulation and controls. PPRC has focused on alternative ways policymakers might approach looming economic problems and on research advancing solutions that recognize the fundamentals of private-sector decision-making with respect to economic structure at both micro and macro levels.

For information write Dr. Robert F. Lanzillotti, Director, Public Policy Research Center, 201 Bryan Hall.

PUBLIC UTILITY RESEARCH CENTER

Florida's Public Utility Research Center (PURC) was organized in 1972. Its Executive Committee includes representatives of public utilities, the University, the Florida Public Service Commission, and the Florida Public Counsel. PURC's primary objectives are (1) to increase student and faculty awareness of the utility industry and its problems, (2) to undertake research designed to help solve problems faced by the energy and communication industries, and (3) to train students for employment by utility companies and regulatory authorities.

PURC seeks to accomplish these goals by providing student fellowships and assistantships, by supporting faculty research, by holding conferences and seminars to discuss both major policy issues and current faculty research, and by serving as a contact point between business, government, and the academic community.

PURC's research is disseminated in working papers, journals, and books, as well as in professional meetings and governmental hearings. Major areas of interest include measurement of the cost of capital; financing utility construction programs; the restructuring of the telecommunications industry; rate design for telephone, gas, and electric utilities; and other timely issues which are important to utility companies, consumers, and regulators.

Write the Executive Director, Public Utility Research Center, 205 Matherly Hall, for information.

REAL ESTATE RESEARCH CENTER

The Real Estate Research Center was established in 1973 to facilitate the study of business and economic problems related to real estate. Faculty members in the field of real estate serve as the core staff members of the Center, with research assistance provided by several graduate students. Faculty members in other departments and colleges participate in projects requiring multidisciplinary inputs. Graduate students also conduct their own research for theses and dissertations in the Center.

The Center also sponsors or cosponsors a number of continuing education programs in real estate each year. Courses and seminars typically are presented in the areas of mortgage banking, financial institutions, real estate appraisal, and real estate investment analysis. Most of these courses and seminars are open to full-time undergraduate and graduate students in real estate at the University of Florida.

Many types of research projects are conducted in the Center. They range from economic and social issues in land use planning to analysis of the managerial process and rates of return in various types of real estate businesses and properties. The Center has developed textual materials for organizations such as the Florida Real Estate Commission and the Appraisal Institute.

Contract research projects in the Center have been sponsored and funded by various agencies of the Florida state government, city governments, the Florida Real Estate Commission, and the Appraisal Institute Foundation. For information write the Director, Real Estate Research Center, 337 Business Building.

CENTER FOR RETAIL EDUCATION AND RESEARCH

The Center for Retail Education and Research (CRER) sponsors and facilitates faculty and student research on retailing issues and problems. Recent topics include models to aid management decision making, effects of compensation plans on sales-associate, performance, customer service, mall and store choice, and relationships between suppliers and retailers, and elderly consumers in the retail environment. In some cases, the Center provides stipends to graduate students conducting retail research. The Center hosts an annual symposium for retailing executives.

For information, write the Director, Center for Retail Education and Research, 200 Bryan Hall.

CENTER FOR STUDIES OF ADVANCED STRUCTURAL COMPOSITES

The Center for Studies of Advanced Structural Composites in the Department of Aerospace Engineering, Mechanics, and Engineering Science was established in 1979 within the Center for Excellence Program in New Materials. The purpose of the Center of Excellence Program is to aid in the development of high technology indusry in Florida by conducting research and engineering development of new materials, and by preparing master's and doctoral candidates in this field for later employment in Florida industries. The Center was organized to conduct research in the host department and also to provide a focal point for interaction with other departments, other universities, research institutes, government laboratories, and industries in research related to problems involving design, fabrication, and analysis of structural composites.

CENTER FOR WETLANDS AND WATER RESOURCES

The Center for Wetlands merged with the Florida Water Resources Research Center in August 1991 to become the Center for Wetlands and Water Resources. As a team, the two centers address today's environmental problems and issues with greater expertise and pooled resources. To begin to perceive the future direction of this new center, a brief history of each center as a separate entity follows.

The Center for Wetlands is an intercollege research division dedicated to understanding wetlands and their roll in the partnership of humanity and nature. The Center encourages interdisciplinary research on ecology problems, management, and reclamation, and effective use of wetlands. The Center advances knowledge through special research approaches such as systems ecology modeling and simulation, energy analysis and planning, field experiments on vegetation response to water control, reclamation of wetlands and surrounding watersheds, and regional planning. The Center fosters campus and statewide communication through a central workshop activity, organized research projects of county and state concern, wetlands publications, conferences and short courses, research data collections, and proposals for curricula. Support of faculty and graduate students is provided by active projects. The Center has projects with several state and federal agencies (the Environmental Protection Agency, the National Science Foundation, the Florida Department of Environmental Regulation, the Florida Institute of Phosphate Research, and others).

The Florida Water Resources Research Center, funded by the Department of the Interior, was established in 1964 as a result of the passage of Public Law 88-379—The Water Resources Research Act of 1964—"to stimulate, sponsor, provide for, and supplement present programs for conduct of research, investigation, experiments, and the training of scientists in the fields of water and of resources which affect water." Under the administration of the Water Resources Research Center, current water research projects pertaining to the achievement of adequate statewide water resources management and water quality and quantity are being conducted by faculty at the University of Florida and at other universities in the state.

The Graduate Certificate in Wetlands provides graduate students majoring in science and engineering with courses and experience that complement their majors with preparation for wetlands and water quality-related careers. The certificate requires 18 credit hours, including courses and wetland and water research experience. Work includes an introductory wetlands course and courses selected from several related categories including hydrology, biology, environmental policy, water chemistry, and soils. For additional information, write the Director, Center for Wetlands and Water Resources, Phelps Laboratory.

STUDENT SERVICES

CAREER RESOURCE CENTER

The Career Resource Center, Suite G-1, J. Wayne Reitz Union, is the central agency for career planning, job placement, and cooperative education on the University of Florida campus. The Center coordinates these activities for all graduate students and alumni seeking employment opportunities. The CRC also has branch offices in 358 Little Hall for the College of Liberal Arts and Sciences and 2002B McCarty Hall for the College of Agriculture.

Graduate students seeking to explore career interests, organize their job search campaign, or gain skills in resume and interview techniques are invited to visit the Center and utilize its services. The Center has an extensive career library with directories of employers and averages over 800 job openings each week.

For those graduate students seeking individual assistance in resolving career and academic problems, the Center has a number of career and job placement counselors available for personal appointments.

A significant on-campus job interview program with representatives from business, industry, government, and education is conducted by the Center. These major employers come to campus seeking graduating students in most career fields. Graduate students are encouraged to register early and to participate in the on-campus interview program. The Center also sponsors a number of Career Days and EXPOs during the academic year which bring employers to campus to talk to students about careers and jobs. These sessions are open to all majors and are an ideal way for graduate students to make contact with potential employers.

The Center also hosts Graduate and Professional School Day the first week in November, bringing to campus representatives from 35 to 45 colleges and universities around the country. Students may gather information and ask questions about various graduate and professional education programs offered by these institutions.

Other functions of the Center include (1) serving as liaison between students and employers; (2) conducting studies on the employment outlook, salary trends, and progress of graduates; (3) helping identify speakers from business and industry who can visit campus to discuss innovations that are taking place in industry.

The Center also provides reproduction and distribution services of professional placement files (qualifications records, vitae, resumes, and personal references). A modest charge is assessed to cover labor and materials for copy services and mailing of these credential packages to employers.

EDITORIAL ASSISTANCE AND INFORMATION

The Graduate School Editorial Office provides a *Guide for Preparing Theses and Dissertations* to assist the student in the preparation of the manuscript and offers suggestions and advice on such matters as the preparation and reproduction of illustrative materials, the treatment of special programs, the use of copyrighted material, and how to secure a copyright for a dissertation. The following procedures apply to the Graduate School's editorial services to students.

1. The responsibility for acceptable English in a thesis or dissertation, as well as the originality and acceptable quality of the content, lies with the student and the supervisory committee.
2. The Graduate School editorial staff act only in an advisory capacity but will answer questions regarding correct grammar, sentence structure, and acceptable forms of presentation.
3. The editorial staff will examine a limited portion of the final rough draft and make recommendations concerning the form of the thesis or dissertation before the final typing.
4. After the initial submission of the dissertation in final form, the Editorial Office staff check the format, paper stock, and pagination and read portions of the text for general usage, references, and bibliographical form. Master's theses are checked for paper stock, format, reference style, pagination, and signatures.

It is the responsibility of the student and the supervisory chairman to notify the Graduate School in writing of any changes which have been made in the structure of the supervisory committee.

5. The Editorial Office maintains a file of experienced thesis typists, manuscript editors, and draftspersons that the student may consult to find assistance in the mechanical preparation of the manuscript.

ENGLISH SKILLS FOR INTERNATIONAL STUDENTS

The English Language Institute (ELI) offers a noncredit, nondegree program in English as a second language for applicants to the University who need to increase their competence. Courses at all levels are offered in the fall, spring, and summer terms as well as a short session (mid-July to mid-August), which is strongly recommended to incoming students as a refresher course. ELI emphasizes oral and written skills needed by persons who wish to attend a university in the U.S., providing short courses in a variety of subjects, including TOEFL preparation. In addition to regular English Language Institute testing, an institutional administration of TOEFL is given near the end of fall, spring, and summer terms. Further information is available from the English Language Institute, 315 Norman Hall, telephone (904) 392-2070.

Scholarly Writing and Academic Spoken English.— Two programs intended to help international graduate students are offered by the Program in Linguistics: Scholarly Writing (SW) and Academic Spoken English (ASE). Scholarly Writing is useful to all students who would like to master the forms of writing they need in their course work, including the technical paper. Students identified as likely to need help with English writing are required to take a writing test upon arrival at the University. The results determine whether they must enroll in ENS 4449. A second course, ENS 4450, is designed for those students about to begin writing their theses or dissertations. It includes report writing, resumes, business letters, grant proposals, and thesis writing. Information about the SW program is available from the SW Coordinator, Linguistics, 112 Anderson Hall, telephone (904) 392-0639. The Academic Spoken English program offers three classes which address the oral skills needed for daily communication in a classroom situation. ENS 5501 (Academic Spoken English I) is a basic, intensive course for graduate students scoring below 220 on the SPEAK test. ENS 5502

(Academic Spoken English II) is required for students who score between 220 and 250 on the SPEAK test and have a teaching appointment. The course focuses on language and on cultural and pedagogical problems which international teaching assistants encounter in their classrooms. ENS 5503 (Academic Spoken English Tutorial) is designed for students who have completed ENS 5501 or who scored above 220 on the SPEAK test. International graduate students are matched with American undergraduates seeking tutoring; the tutoring sessions are videotaped and then serve as the basis for instruction in communication and teaching skills. ENS 4449, 4450, 5501, 5502, and 5503 may not be used to meet any graduate degree requirement. To contact the ASE office, call (904) 392-3286.

International applicants should check with their departments to determine whether they will need to take courses in the ELI, ASE, or SW program.

GRADUATE STUDENT HANDBOOK

The Graduate School makes available to all students a summary of useful information in the *Graduate Student Handbook*. Copies are distributed to new students by the graduate dean's office.

INTERNATIONAL STUDENT SERVICES

The Office for International Student and Scholar Services (OISSS)—a part of the Office for International Studies and Programs—is the hub for services performed on behalf of foreign students from their arrival on campus until their departure for home. The Office coordinates with other University agencies and is charged with responsibilities involving evaluation of financial statements; issuance of certificates of eligibility (Forms 1-20 and IAP-66) for visa application; reception; orientation; off-campus housing; finances; health; immigration matters; practical training; employment; liaison with embassies, consulates, foundations, and United States government agencies; correspondence; legal problems; life counseling; referrals; and community relations. The Office also assists foreign faculty members. OISSS is located at 1504 West University Avenue. Mail can be addressed to the Director, International Student Services.

The Office for Overseas Studies administers student summer and full-year study abroad programs. Its personnel counsel students interested in study overseas, provide a library of materials, and coordinate all overseas programs for students. The Office is located at 123 Tigert Hall.

SPEECH AND HEARING CLINIC

The University of Florida Speech-Language and Hearing Clinic, located on the fourth floor of Dauer Hall, offers therapeutic and diagnostic services to the community. These services are available to any University student without charge. The Clinic offers assistance at any time during the year and therapy sessions are adjusted to individual schedules. Students are encouraged to visit the Clinic office, 435 Dauer Hall, or call 392-2041 and use this service.

STUDENT HEALTH SERVICE

The Student Health Service provides a spectrum of medical services which includes primary medical care, health education, specialty services, and mental health consultation and counseling.

The Service consists of an out-patient clinic staffed by physicians, physician assistants, nurse practitioners, registered nurses, psychiatrists, and psychologists. Health education staff provide in-house counseling on a variety of health topics. SHS also provides a pharmacy, a clinical laboratory, and radiology services. All of these services are in the Infirmary which is centrally located on campus.

The health fee is part of the tuition fee paid by all students. The health fee covers ordinary out-patient visits, and fees-for-services are assessed for pharmacy, laboratory, and x-ray services as well as special treatments and consultations with medical specialists. The supplemental student government sponsored insurance plan is highly recommended to help defray these expenses.

A personal health history questionnaire completed by the student is required before registration at the University of Florida as well as documentation of immunity to measles and rubella.

UNIVERSITY COUNSELING CENTER

The University Counseling Center offers a variety of counseling and student development services to full-time students and their spouses. The Center is staffed by psychologists to aid in the growth and development of each student and to assist students in getting the most out of their college experience. Services offered at the Center include the following:

Counseling.—Individual, couple, and group counseling is available to help students with personal, career, and academic concerns. Appointments to see a counselor may be made by calling the Center at 392-1575 or in person at 301 Peabody Hall. There is an initial interview in which the student and the counselor make decisions about the type of help needed. Students requiring immediate help are seen on a nonappointment emergency basis. Counseling interviews are confidential.

Consulting.—Center psychologists are available for consulting with students, staff, professionals, and faculty. These consultations focus on working with individual students, special programs, organizational problems, ways of improving student environments, and other issues that may have important psychological dimensions.

Career Development.—In addition to career counseling, the Center offers vocational interest testing and career workshops. The Center also provides referral information to students seeking specific career information.

Group and Workshop Program.—The Center offers a wide variety of groups and workshops. A number of them, such as the women's support group and the black women's enrichment group, are designed for special populations. Others such as the math confidence groups, assertiveness workshops, and counseling groups are formed to help participants deal with common problems and learn specific skills. A list of available groups and workshops is published at the beginning of each term.

Teaching/Training.—The Center provides a variety of practicum and internship training experience for students in counseling psychology, counselor education, and rehabilitation counseling. Center psychologists also teach undergraduate and graduate courses in some of these departments.

CounseLine.—A self-help tape program designed to provide information on how to cope with the problems of daily living is sponsored by the Center. Students may call 392-1683 and ask for any of the 34 tapes that are available. A list of tapes is published periodically in the student newspaper and is also available at the Center.

Fields of Instruction

FIELDS OF INSTRUCTION

COLLEGES AND AREAS OF INSTRUCTION

AGRICULTURE
- General
- Agricultural Education and Communication
- Agricultural Engineering
- Agronomy
- Animal Science
- Dairy Science
- Entomology and Nematology
- Food and Resource Economics
- Food Science and Human Nutrition
- Forest Resources and Conservation, School of
- Horticultural Science
  - Environmental Horticulture
  - Horticultural Sciences
- Microbiology and Cell Science
- Plant Molecular and Cellular Biology
- Plant Pathology
- Poultry Science
- Soil and Water Science

ARCHITECTURE
- Architecture
- Building Construction, M. E. Rinker School of
- Landscape Architecture
- Urban and Regional Planning

BUSINESS ADMINISTRATION
- General
- Accounting, Fisher School of
- Computer and Information Sciences
- Decision and Information Sciences
- Economics
- Finance, Insurance, and Real Estate
- Health Services Administration
- Management
- Marketing

EDUCATION
- Counselor Education
- Educational Leadership
- Foundations of Education
- Instruction and Curriculum
- Special Education

ENGINEERING
- Aerospace Engineering, Mechanics, and Engineering Science
- Agricultural Engineering
- Chemical Engineering
- Civil Engineering
- Coastal and Oceanographic Engineering
- Computer and Information Sciences
- Electrical Engineering
- Environmental Engineering Sciences
- Industrial and Systems Engineering
- Materials Science and Engineering

ENGINEERING (continued)
- Mechanical Engineering
- Nuclear Engineering Sciences

FINE ARTS
- Art
- Music
- Theatre

HEALTH AND HUMAN PERFORMANCE
- Exercise and Sport Sciences
- Health Science Education
- Recreation, Parks, and Tourism

HEALTH RELATED PROFESSIONS
- General
- Clinical and Health Psychology
- Communicative Disorders
- Health Services Administration
- Occupational Therapy
- Physical Therapy
- Rehabilitation Counseling

JOURNALISM AND COMMUNICATIONS
- Mass Communication

LAW
- Taxation

LIBERAL ARTS AND SCIENCES
- African Studies, Center for
- Anthropology
- Astronomy
- Botany
- Chemistry
- Classics
- Communication Processes and Disorders
- Computer and Information Sciences
- English
- Geography
- Geology
- Germanic and Slavic Languages and Literatures
- Gerontological Studies, Center for
- History
- Latin America Studies, Center for
- Linguistics
- Mathematics
- Philosophy
- Physics
- Plant Molecular and Cellular Biology
- Political Science
- Psychology
- Religion
- Romance Languages and Literatures
  - French
  - Portuguese
  - Spanish
- Sociology
- Statistics
- Women's Studies
- Zoology

MEDICINE
- General
- Anatomy and Cell Biology
- Biochemistry and Molecular Biology
- Immunology and Medical Microbiology
- Neuroscience
- Oral Biology
- Pathology and Laboratory Medicine
- Pharmacology and Therapeutics
- Physiology

NURSING

PHARMACY
- General
- Medicinal Chemistry
- Pharmaceutics
- Pharmacodynamics
- Pharmacy Health Care Administration

VETERINARY MEDICINE
- Veterinary Medical Sciences

FISHER SCHOOL OF ACCOUNTING
College of Business Administration

GRADUATE FACULTY 1993-94

Director: D. Snowball. *Graduate Coordinator:* W. R. Knechel. *Graduate Research Professor:* A. R. Abdel-khalik. *Professors:* B. B. Ajinkya; W. R. Knechel; J. L. Kramer; W. F. Messier, Jr.; J. Simmons; D. Snowball. Associate *Professors:* J. V. Boyles; S. S. Kramer; C. L. McDonald. *Assistant Professors:* A. S. Ahmed; K. E. Hackenbrack; G. M. McGill; J. A. Yost.

The Fisher School of Accounting offers graduate work leading to the Master of Accounting (M.Acc.) degree and the Ph.D. degree with a major in business administration and an accounting concentration. The M.Acc. degree program offers specialization in each of the three areas of auditing/financial accounting, accounting systems, and taxation. A joint program leading to the Juris Doctor and Master of Accounting degrees also is offered by the Fisher School of Accounting and College of Law. Specific details for the M.Acc., M.Acc./J.D., and Ph.D. programs will be supplied by the Fisher School of Accounting upon request.

The M.Acc. and the Ph.D. accounting programs require admission standards of at least the following: A combined verbal and quantitative score of 1200 on the Graduate Record Examination (GRE), or a score of 550 on the Graduate Management Admission Test (GMAT). Admission to the M.Acc. or Ph.D. accounting graduate programs cannot be granted until scores are received.

Information on minimum GPA standards for admission to the M.Acc. program may be obtained from the office of the Associate Director. Foreign students must submit a TOEFL score of at least 570 with a minimum of 60 on the first section, 55 on the second section, and 55 on the third section, and a satisfactory GMAT or GRE score.

The recommended curriculum to prepare for a professional career in accounting is the 3/2 five-year program with a joint awarding of the Bachelor of Science in Accounting and Master of Accounting upon completion of the 156-hour program. The entry point into the 3/2 program is the beginning of the senior year.

Students who have already completed an undergraduate degree in accounting may enter the one-year M.Acc. degree program which requires satisfactory completion of 34 hours of course work. A minimum of 20 credits must be in graduate level courses; a minimum of 16 credits must be in graduate level accounting courses. The remaining credits are selected from recommended elective courses that vary by area of specialization. Students are cautioned to seek early advisement since many graduate courses are offered only once a year.

Requirements for the Ph.D. degree include a core of courses in mathematical methods, statistics, and economic theory; one or two supporting fields selected by the student; and a major field of accounting. Students are expected to acquire teaching experience as part of the Ph.D. degree program. Grants-in-aid will be awarded for this teaching. Foreign students must submit a Test of Spoken English (TSE) test score of at least 220 along with satisfactory GMAT/GRE and TOEFL scores in order to obtain a teaching appointment. Students are expected to enroll in ACG 6940 for a minimum of three credits. Program requirements include fulfillment of a research skill area and a dissertation on an accounting-related topic.

ACG 5205—Advanced Financial Accounting (3) *Prereq: ACG 3142.* Analysis of accounting procedures for consignment and installment sales, partnerships, branches, consolidations, foreign operations, governmental accounting and other advanced topics.

ACG 5385—Advanced Accounting Analysis for the Controllership Function (3) A study of planning and control as they relate to management of organizations. Draws from cases and journals to integrate managerial accounting concepts.

ACG 5655—Auditing Theory and Internal Control II (3) *Prereq: ACG 4652.* A continuation of ACG 4652 with detailed coverage of field work procedures for internal control and substantive audit testing, statistical sampling, operational auditing, and audit software packages.

ACG 6065—Financial and Managerial Accounting (3) *Prereq: QMB 5200, ECP 6705, MAN 6156, ISM 5021; coreq: MAN 5505, FIN 5405, MAR 6805. Designed for MBA students.* Financial statement analysis including techniques, cash flow, and impact of accounting principles. Management control systems: planning, budgeting, reporting, analysis, and performance evaluation.

ACG 6135—Accounting Concepts and Financial Reporting Standards (3) *Prereq: ACG 3142.* Current developments in accounting concepts and principles and their relevance to the status of current accounting practices. Special topics in financial accounting and current reporting problems facing the accounting profession. Review of current authoritative pronouncements.

ACG 6296—Financial Reporting and Auditing for Specialized Industries (3) *Prereq: ACG 5205, 5655.* Current developments.

ACG 6405—Accounting Database Management Systems (3) *Prereq: ACG 4451.* Investigation of the design and development.

ACG 6495—Management Information Systems Seminar (3) *Prereq: ACG 4451.*

ACG 6625—EDP Auditing (3) *Prereq: ACG 4451, 5655.* Concepts related to auditing in computerized data environments.

ACG 6659—Advanced Auditing Topics (3) *Prereq: ACG 5655.* Current technical issues and review of audit research.

ACG 6696—Financial Accounting Issues and Cases (3) *Prereq: ACG 5205.* A study of recent and projected developments in financial reporting and auditing emphasizing cases, journal articles, and pronouncements.

ACG 6835—Interdisciplinary Considerations in Accounting Theory Development (3) Developments in related disciplines, such as economics, law, and behavioral sciences, analyzed for their contribution to accounting thought.

ACG 6845—Accounting and Analytical Methods (3) Utilization of logic, including mathematics, in formulation of alternative accounting valuation models and in clarification of accounting concepts.

ACG 6905—Individual Work in Accounting (1-4; max: 7) *Prereq: approval of graduate coordinator.* Reading and research in areas of accounting.

ACG 6910—Supervised Research (1-5; max: 5) S/U.

ACG 6940—Supervised Teaching (1-5; max: 5) S/U.

ACG 6957—International Studies in Accounting (1-4; max: 12) *Prereq: admission to approved study abroad program and permission of department.* S/U.

ACG 7699—Auditing Research (3) *Prereq: ACG 7886.* An intensive study of such topics as the role of auditing, quantitative modeling and behavioral implications of the audit process, statistical sampling and other current topics.

ACG 7885—Accounting Research I (4) *Prereq: ACG 6135; coreq: FIN 6446.* Market use of information, properties of accounting information, and market structure.

ACG 7886—Accounting Research II (4) *Prereq: ACG 7885.* Theoretical constructs in accounting, valuation models, information asymmetry and production, and nonmarket information use.

ACG 7887—Research Analysis in Accounting (3) *Prereq: ACG 7886.* Analysis of accounting research and presentation of student research project results. Financial accounting, managerial accounting, auditing, taxation, management information systems, and information economics.

ACG 7925—Accounting Research Workshop (1-4; max: 8) *Prereq: completion of Ph.D. core.* Analysis of current research topics in accounting by visiting scholars, faculty, and doctoral students. S/U

ACG 7939—Theoretical Constructs in Accounting (3) *Prereq: ACG 7886.* Emerging theoretical issues that directly impact research and development of thought in accounting. Theory construction and verification, information economics, and agency theory constitute subsets of this course.

ACG 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U

ACG 7980—Research for Doctoral Dissertation (1-15) S/U.

TAX 5025—Federal Income Tax Accounting II (3) *Prereq: TAX 4002. Not open to persons in the tax concentration.* Covers basic tax research, taxation of corporations, partnerships, and other appropriate topics.

TAX 5065—Federal Income Tax Research (3) *Prereq: TAX 4002.* Basic techniques for researching federal income tax questions. Use and application of traditional and computerized tax research to examine IRS tax documentation.

TAX 5725—Tax Factors in Management Decisions (3) *Open to MBA and other graduate students who have not previously completed TAX 4002 or its equivalent.* Examines the income and deduction concepts, the taxation of property transactions, the taxation of business entities, the selection of a business form and its capital structure, employee compensation, formation and liquidation of a corporation, changes in the corporate structure, and the use of tax shelters.

TAX 6105—Corporate Taxation (3) *Prereq: TAX 5065.* Examination of the fundamental legal concepts, the statutory provisions, and the computational procedures applicable to economic transactions and events involving the formation, operation, and liquidation of the corporate entity. Consideration is also given to acquisitive and divisive changes to the corporate structure.

TAX 6205—Partnership Taxation (3) *Prereq: TAX 5065.* Examines the tax aspects of the partnership as a business entity. Topics include the acquisition of a partnership interest; the reporting of partnership profits, losses, and distributions; transactions between partners and the partnership; transfers of a partnership interest; and retirement or death of a partner.

TAX 6405—Estate and Gift Taxation (3) *Prereq: TAX 5065.* Examination of the federal excise tax levied on transfers of property via gift or from decedents' estates.

TAX 6505—International Taxation (3) *Prereq: TAX 5065.* Topics include the foreign tax credit, taxation of U.S. citizens abroad, taxation of nonresident aliens doing business in the U.S., tax treaties, taxation of income from investments abroad, taxation of export operations, foreign currency translation, intercompany pricing, and boycott and bribe related income.

TAX 6875—Contemporary Tax Topics (3) *Prereq: TAX 5065, 6205.* Consolidations, alternative minimum tax, loss limitation rules, personal financial planning, etc.

AEROSPACE ENGINEERING, MECHANICS, AND ENGINEERING SCIENCE
College of Engineering

GRADUATE FACULTY 1993-94

Chairman: M. A. Eisenberg. *Graduate Coordinator:* D. W. Mikolaitis. *Graduate Research Professors:* N. D. Cristescu; R. G. Dean; D. C. Drucker; A. E. S. Green. *Professors:* R. C. Anderson; I. K. Ebcioglu; M. A. Eisenberg; R. L. Fearn; G. W. Hemp; C. C. Hsu; U. H. Kurzweg; E. R. Lindgren; L. E. Malvern *(Emeritus)*; G. E. Nevill, Jr.; M. K. Ochi; E. Partheniades; C. A. Ross; W. Shyy; C. T. Sun; E. K. Walsh; H. Wang. *Engineers:* H. W. Doddington; J. E. Milton. *Associate Professors:* D. W. Mikolaitis; B. V. Sankar; L. Vu-Quoc; D. C. Zimmerman; P. H. Zipfel. *Associate Engineers:* R. J. Hirko; D. A. Jenkins. *Assistant Professors:* J. D. Abbitt; D. M. Belk; B. F. Carroll; N. G. Fitz-Coy; P. A. Mataga.

The Department of Aerospace Engineering, Mechanics, and Engineering Science offers the Master of Engineering, Master of Science, and Engineer degrees in aerospace engineering, in engineering mechanics, and in engineering science. The Department participates in the College of Engineering's interdisciplinary Certificate in Manufacturing Engineering at the master's level. The Doctor of Philosophy degree is offered in aerospace engineering and in engineering mechanics, with specialized tracks in the latter discipline in design processes, engineering analysis and applied mathematics, and in theoretical and applied mechanics. The Department also offers interdisciplinary master's and Ph.D. specializations in offshore structures in cooperation with the Departments of Coastal and Oceanographic Engineering and Civil Engineering.

Areas of specialization include aerodynamics, applied mathematics, applied optics, atmospheric science, biomedical engineering, coastal hydromechanics and ocean wave dynamics, combustion, composite materials, control theory, creative design, design automation, fluid mechanics, numerical and finite element methods, offshore structures, solid mechanics, and structural mechanics and optimization.

With the approval of the supervisory committee, all 5000-, 6000-, and 7000-level courses offered by the Aerospace Engineering, Mechanics, and Engineering Science Department plus the following courses in related areas are acceptable for graduate major credit for all degree programs offered by the Department: CAP 6627—Expert Systems, CAP 6635—Artificial Intelligence Concepts, CAP 6651—Knowledge Representation; CAP 6610—Machine Learning, EEL 5182—State Variable Methods in Linear Systems, EEL 5631—Digital Control Systems, EEL 5840—Elements of Machine Intelligence, EEL 6614—Modern Control Theory I, EEL 6615—Modern Control Theory II, EEL 6841—Machine Intelligence and Synthesis, ENU 6730—Introduction to Plasmas.

EAS 5938—Special Topics in Aerospace Engineering (1-4; max: 8)

EAS 6135—The Dynamics of Real Gases (3) *Prereq: consent of instructor.* Kinetic theory and flows of reacting gases.

EAS 6138—Gasdynamics (3) *Prereq: EAS 4112, 4112L.* Theory of sound waves, subsonic and supersonic flows, shockwaves, explosions and implosions.

EAS 6221—Plates and Shells I (3) *Prereq: EAS 4210 or equivalent.* Bending and stretching of plates, effects of large deflection, anisotropy, nonhomogeneity (composite and stiffened plates), and transverse shear. Geometry of shells and membrane theory. Aerospace applications.

EAS 6222—Plates and Shells II (3) *Prereq: EAS 6221.* Bending of thin shells, shells of revolution. Buckling and vibration of plates and shells. Shell-like structures. Numerical methods. Aerospace applications.

EAS 6225—Aerodynamics of Wings and Bodies (3) *Prereq: EAS 4106, 4112, or equivalent.* Classical aerodynamic theory including thin-wing theory, slender-body theory, and three-dimensional wings in steady flow.

EAS 6242—Advanced Structural Composites I (3) *Prereq: EGM 3520.* Micro- and macro-behavior of a lamina. Stress transfer of short fiber composites. Classical lamination theory, static analysis of laminated plates, free-edge effect, failure modes.

EAS 6243—Advanced Structural Composites II (3) *Prereq: EAS 6242 or equivalent.* Fracture behavior of composites, interlaminar stresses, internal damping in composites.

EAS 6415—Guidance and Control of Aerospace Vehicles (3) *Prereq: EAS 4412 or equivalent.* Application of modern control theory to aerospace vehicles. Parameter identification methods applied to aircraft and missiles.

EAS 6905—Aerospace Research (1-6; max: 12 including EGM 5905 and 6905)

EAS 6910—Supervised Research (1-5; max: 5) S/U.

EAS 6935—Graduate Seminar (1; max: 6) S/U option.

EAS 6939—Special Topics in Aerospace Engineering (1-6; max: 12) Laboratory, lectures, or conferences covering selected topics in space engineering.

EAS 6940—Supervised Teaching (1-5; max: 5) S/U.

EAS 6971—Research for Master's Thesis (1-15) S/U.

EAS 6972—Research for Engineer's Thesis (1-15) S/U.

EAS 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.

EAS 7980—Research for Doctoral Dissertation (1-15) S/U.

EGM 5005—Laser Principles and Applications (3) *Prereq: consent of instructor.* Operating principles of solid, electric discharge, gas dynamic and chemical lasers. Applications of lasers of lidar aerodynamic and structural testing and for cutting and welding of materials.

EGM 5111L—Experimental Stress Analysis (3) *Prereq: EGM 3520.* Introduction to techniques of experimental stress analysis in static systems. Lecture and laboratory include applications of electrical resistance strain gauges, photoelasticity, brittle coatings, moire fringe analysis, and X-ray stress analysis.

EGM 5121C—Experimental Deduction (4) *Prereq: consent of instructor.* Fundamentals of dynamics and fluid mechanics. Designed to confront the student with the unexpected.

EGM 5421—Modern Techniques of Structural Dynamics (3) *Prereq: EGM 3400 or 3420; 3311, 3520, and COP 3212.* Modern methods of elastomechanics and high speed computation. Matrix methods of structural analysis for multi-degree-of-freedom systems. Modeling of aeronautical, civil, and mechanical structural engineering systems.

EGM 5435—Intermediate Dynamics (3) *Prereq: EGM 3400 or 3420, and EGM 3311.* Dynamics of a particle, orbital mechanics, mechanics in non-inertial frames, dynamics of a system of particles, rigid body dynamics in plane motion, moments and products of inertia, conservation laws, Lagrange's equations of motion.

EGM 5533—Advanced Mechanics of Solids and Structures (3) *Prereq: EGM 3520.* Bars, beams, thin-walled structures, and simple continua in the elastic and inelastic range. Virtual work approaches, elastic energy principles, plastic limit theorems, creep deformation procedures, introduction to instability and fracture mechanics. Design applications.

EGM 5584—Principles of Mechanics in Biomedical Engineering (3) *Prereq: EGN 3353 and EGM 3520.* Introduction to the solid and fluid mechanics of biological systems. Rheological behavior of materials subjected to static and dynamic loading. Mechanics of the cardiovascular, pulmonary, and renal systems. Mathematic models and analytical techniques used in the biosciences.

EGM 5816—Intermediate Fluid Dynamics (4) *Prereq: EGN 3353, MAP 3302.* Basic laws of fluid dynamics, introduction to potential flow, viscous flow, boundary layer theory, and turbulence.

EGM 5905—Individual Study (1-6; max: 12 including EGM 6905 and EAS 6905)

EGM 5933—Special Topics in Engineering Science and Mechanics (1-4; max: 8)

EGM 6215—Theory of Structural Vibrations (3) *Prereq: EGM 4200.* Multiple degree-of-freedom systems, lumped parameter procedures; matrix methods; free and forced motion. Normal mode analysis for continuous systems. Lagrange equations. Numerical methods.

EGM 6321—Principles of Engineering Analysis I (3) *Prereq: EGM 4313 or MAP 4305.* Solution of linear and nonlinear ordinary differential equations. Methods of Frobenius, classification of singularities. Integral representation of solutions. Treatment of the Bessel, Hermite, Legendre, hypergeometric, and Mathieu equations. Asymptotic methods including the WBK and saddle point techniques. Treatment of nonlinear autonomous equations. Phase plane trajectories and limit cycles. Thomas-Fermi, Emden, and van der Pol equations.

EGM 6322—Principles of Engineering Analysis II (3) *Prereq: EGM 4313 or MAP 4341.* Partial differential equations of first and second order. Hyperbolic, parabolic, and elliptic equations including the wave, diffusion, and Laplace equations. Integral and similiarity transforms. Boundary value problems of the Dirichlet and Neumann type. Green's functions, conformal mapping techniques, and spherical harmonics. Poison, Helmholtz, and Schroedinger equations.

EGM 6323—Principles of Engineering Analysis III (3) *Prereq: EGM 4313 or MAP 4341.* Integral equations of Volterra and Fredholm. Inversion of self-adjoint operators via Green's functions. Hilbert-Schmidt theory and the bilinear formula. The calculus of variations. Geodesics, Euler-Lagrange equation and the brachistochrone problem. Variational treatment of Sturm-Liouville problems. Fermat's principle.

EGM 6341—Numerical Methods of Engineering Analysis I (3) *Prereq: EGM 4313 or equivalent.* Finite-difference calculus; interpolation and extrapolation; roots of equations; solution of algebraic equations; eigenvalue problems; least-squares method; quadrature formulas; numerical solution of ordinary differential equations; methods of weighted residuals. Use of digital computer.

EGM 6342—Numerical Methods of Engineering Analysis II (3) *Prereq: EGM 6341 or consent of instructor.* Finite-difference methods for parabolic, elliptic, and hyperbolic partial differential equations. Application to heat conduction, solid and fluid mechanics problems.

EGM 6351—Finite Element Methods (3) *Prereq: consent of instructor.* Displacement method formulation; generalization by means of variational principles and methods of weighted residuals; element shape functions. Application to heat conduction, solid and fluid mechanics problems. Use of general purpose computer codes.

EGM 6444—Advanced Dynamics (3) *Prereq: EGM 5435.* The principle of least action, conservation laws, integration of the equations of motion, collision, free and forced linear and nonlinear oscillations, rigid body motion, the spinning top, motion in non-inertial frames, canonical equations.

EGM 6551—Thermal Stress Analysis (3) *Prereq: EML 4142, EGM 5533 or equivalents.* Coupled and uncoupled thermoelastic theory. Static and quasi-stationary plan problems, dynamic effects, thermal stresses in structures, thermoelastic stability, inelastic thermal response.

EGM 6570—Principles of Fracture Mechanics (3) *Prereq: EGM 6611.* Introduction to the mechanics of fracture of brittle and ductile materials. Linear elastic fracture mechanics; elastic-plastic fracture; fracture testing; numerical methods; composite materials; creep and fatigue fracture.

EGM 6611—Continuum Mechanics I (3) *Prereq: EGM 3520.* Tensors of stress and deformation. Balance and conservation laws, thermodynamic considerations. Examples of linear constitutive relations. Field equations and boundary conditions of fluid flow.

EGM 6612—Continuum Mechanics II (3) *Prereq: EGM 6611.* Polar decomposition. Constitutive theory: frame indifference, material symmetry, continuum thermodynamics. Topics selected from wave propagation, mixture theory, director theories, non-orthogonal coordinates.

EGM 6652—Elasticity (3) *Prereq: EGM 6611.* Equations of elasticity and strain energy concepts. Uniqueness theorems and solution of two- and three-dimensional problems for small deformations. Consideration of multiply connected domains and complex variable methods.

EGM 6671—Plasticity (3) *Prereq: EGM 6611.* Virtual work, stability, extremum principles. Applications on the microscale, miniscale, and macroscale. Thermodynamics, internal variables,

damage parameters, time and temperature effects. Fracture mechanics. Finite elastoplasticity.

EGM 6682—Viscoelasticity (3) *Prereq: EGM 6611.* Theories of solid and fluid materials which exhibit history dependence. Development from Boltzmann linear viscoelasticity to general thermodynamic theories of materials with memory; application to initial boundary value problems.

EGM 6812—Fluid Mechanics I (3) *Prereq: EGM 6611 or equivalent.* Equations of fluid flow. Theorems for inviscid flows. Irrotational flows of constant density. Waves in incompressible flows. Inviscid compressible flows.

EGM 6813—Fluid Mechanics II (3) *Prereq: EGM 6812 or equivalent.* Exact and approximate solutions of the Navier-Stokes equations for laminar fluid flows. Instability of laminar flows. Turbulence and turbulent flows.

EGM 6905—Individual Study (1-6; max: 12 including EGM 5905 and EAS 6905)

EGM 6910—Supervised Research (1-5; max: 5) S/U.

EGM 6934—Special Topics in Engineering Mechanics (1-6; max: 12)

EGM 6936—Graduate Seminar (1; max: 6) Discussions and presentations in the fields of graduate study and research. S/U option.

EGM 6940—Supervised Teaching (1-5; max: 5) S/U.

EGM 6971—Research for Master's Thesis (1-15) S/U.

EGM 6972—Research for Engineer's Thesis (1-15) S/U.

EGM 7235—Advanced Vibrations Analysis (3) *Prereq: EGM 6215.* Nonlinear vibrations, stability, perturbation methods, response of single and multiple degree of freedom systems, and continuous systems to random excitations.

EGM 7819—Computational Fluid Dynamics (3) *Prereq: EGM 6342 and 6813 or equivalent.* Finite difference methods for PDE. Navier-Stokes equations for incompressible and compressible fluids. Boundary fitted coordinate transformation, adaptive grid techniques. Numerical methods and computer codes for fluid flow problems.

EGM 7835—Boundary Layer Theory (3) *Prereq: EGN 6813.* Definitive treatment of the Prandtl boundary layer concept for laminar and turbulent flows. Integral methods from Karman-Pohlhausen through current investigators. Thermal boundary layers in forced and natural convection.

EGM 7845—Turbulent Fluid Flow (3) *Prereq: EGM 6813 or equivalent.* Definition of turbulence, basic equations of motion. Instability and transition. Statistical methods, correlation and spectral functions. Experimental methods, flow visualization. Isotropic homogeneous turbulence. Shear turbulence, similitude, the turbulent boundary layer, rough turbulent flow. Jets and wakes. Heat convection, thermally driven turbulence.

EGM 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.

EGM 7980—Research for Doctoral Dissertation (1-15) S/U.

CENTER FOR AFRICAN STUDIES
College of Liberal Arts and Sciences

GRADUATE FACULTY 1993-94

Director: P. R. Schmidt. *Graduate Research Professor:* U. Lele. *Distinguished Service Professor:* C. G. Davis. *Professors:* C. O. Andrew; G. Armelagos; H. Armstrong; M. J. Burridge; B. A. Cailler; R. Cohen; J. H. Conrad; T. L. Crisman; R. H. Davis; H. Der-Houssikian; J. K. Dow; B. M. du Toit; S. Feierman; E. G. Gibbs; C. F. Gladwin; H. L. Gholz; L. D. Harris; P. E. Hildebrand; G. Hyden; C. F. Kiker; M. Langham; R. Lemarchand; M. Lockhart; P. Magnarella; E. L. Matheny; D. McCloud; A. Nanji; H. Popenoe; R. Renner; J. Simpson; N. Smith; A. Spring; P. J. van Blokland. *Associate Professors:* A. Bamia; S. A. Brandt; A. Hansen; M. A. Hill-Lubin; P. A. Kotey; R. E. Poynor; M. Reid; J. Seale; A. Spring. *Assistant Professors:* K. Buhr; A. C. Goldman; J. E. Mason.

The Center for African Studies offers the Certificate in African Studies for master's and doctoral students in conjunction with disciplinary degrees. Graduate courses on Africa or with African content are available in the Colleges or Departments of African and Asian Languages and Literatures, Agriculture, Anthropology, Art, Botany, Economics, Education, English, Food and Resource Economics, Forest Resources and Conservation, Geography, History, Journalism and Communications, Law, Linguistics, Music, Political Science, and Sociology.

A description of the certificate program in African Studies may be found in the section *Special Programs.* Listings of courses may be found in individual departmental descriptions or may be obtained from the Director, 427 Grinter Hall.

AFS 6060—Research Problems in African Studies (3) Research designs for work on African-based problems. Interdisciplinary in scope.

AFS 6905—Individual Work (1-3; max: 9).

AGRICULTURAL EDUCATION AND COMMUNICATION
College of Agriculture

GRADUATE FACULTY 1993-94

Chairman & Graduate Coordinator: C. E. Beeman. *Professors:* L. R. Arrington; C. E. Beeman; E. B. Bolton; J. G. Cheek; M. F. Cole; M. B. McGhee; W. R. Summerhill; B. E. Taylor; C. L. Taylor; D. A. Tichenor; J. T. Woeste. *Associate Professor:* G. D. Israel. *Assistant Professor:* T. S. Hoover.

The Department of Agricultural Education and Communication offers major work for the degrees of Master of Science and Master of Agriculture. The requirements for each degree are described in the *General Information* section.

Three curriculum options for graduate study toward either degree are offered. The extension option is for those persons currently employed or preparing to be employed in the cooperative extension service, including home economics, agriculture, 4-H, and other related areas. The teaching option is for persons who are teaching agricultural education in the public schools and those who wish to enter the profession and require basic certification. The farming systems research-extension for sustainable agriculture option provides technical and social science skills and knowledge for field-level technicians. Emphasis is on sustainable agriculture in developing tropical countries.

A prospective graduate student need not have majored in agricultural education and communications as an undergraduate. However, students with an insufficient background in either agricultural education or technical agriculture will need to include some basic courses in these areas in their program.

The Department of Home Economics offers graduate students with home economics related interests the opportunity for field experience and research activity in the areas of family and consumer economics, housing, and foods and nutrition.

AEE 5037—Agricultural Development Communication (3) Comparative studies of communication and extension education in developing countries, emphasis on planning and implementing change programs in international agricultural development.

AEE 5038—Technical and Scientific Communication in Agriculture (3) Developing better communication skills to reach audiences through a variety of media and methods for scholarly, organizational, and informational purposes. Focus on writing style and strategy for communicating technical and scientific information via journal articles, scholarly papers, mass media, and reports, proposals, and other business-related projects.

AEE 6206—Advanced Instructional Techniques in Agricultural and Extension Education (3) *Prereq: approval of department chairman.* Effective use of instructional materials and methods with emphasis on application of visual and nonvisual techniques.

AEE 6300—Methodology of Planned Change (3) Processes by which professional change agents influence the introduction, adoption, and diffusion of technological changes. Applicable to those who are responsible for bringing about change.

AEE 6325—History and Philosophy of Agricultural Education (2) Historical and philosophical antecedents to current vocational agriculture and extension education programs, social influences which support programs and current trends.

AEE 6417—Administration and Supervision of Agricultural Education (3) Principles and practices related to the effective administration and supervision of agricultural education at the national, state, and local levels.

AEE 6426—Development of a Volunteer Leadership Program (3) Identification, recruitment, training, retention, and supervision of volunteer leaders.

AEE 6512—Program Development in Extension Education (3) Concepts and processes drawn from the social sciences that are relevant to the development of extension education programs.

AEE 6521—Group Dynamics in Agricultural and Extension Education (3) Techniques and approaches used in dealing and working with groups and individuals within groups.

AEE 6523—Planning Community and Rural Development Programs (3) Principles and practices utilized in community and rural development efforts. Determining community needs and goals. Students will be involved in a community development project.

AEE 6541C—Developing Instructional Materials in Agricultural and Extension Education (3) Planning and production of written and visual instructional materials for programs in agricultural education and extension education. Students are required to develop a major instructional project.

AEE 6552—Evaluating Programs in Extension Education (3) Concepts and research drawn from the social sciences relevant to evaluating youth and adult extension programs.

AEE 6611—Agricultural and Extension Adult Education (3) Concepts and principles related to design, implementation, and evaluation of education programs for adults.

AEE 6704—Extension Administration and Supervision (3) Principles and practices for effective administration and supervision of the cooperative extension service program at the county and state levels.

AEE 6767—Research Strategies in Agricultural and Extension Education (3) Overview of significant research. Principles, practices, and strategies for conducting research.

AEE 6905—Problems in Agricultural and Extension Education (1-3; max: 8) *Prereq: approval of department chairman.* For advanced students to select and study a problem related to agricultural and/or extension education.

AEE 6910—Supervised Research (1-5; max: 5) S/U.

AEE 6912—Nonthesis Research in Agricultural and Extension Education (1-3; max: 6) Library and workshop related to methods in agricultural and extension education, including study of research work, review of publications, development of written reports.

AEE 6933—Seminar in Agricultural and Extension Education (1; max: 3) Exploration of current topics and trends.

AEE 6935—Topics in Agricultural and Extension Education (1-3; max: 6)

AEE 6940—Supervised Teaching (1-5; max: 5) S/U.

AEE 6946—Supervised Occupational Experience in Agriculture (3) Basic problems in planning and supervising programs of occupational experiences in view of changes occurring in agricultural education.

AEE 6971—Research for Master's Thesis (1-15) S/U.

HEE 5540—Contemporary Perspectives in Home Economics (3) Intensive analysis of current definitions of home economics, organizational perspectives, budget/legislative decisions affecting home economics programs, accountability issues, and future perspectives for extension and secondary school systems.

HOE 5555—Women and Households in Agricultural Development (3) Women's roles in agricultural households, emphasis on farming systems in developing countries.

AGRICULTURAL ENGINEERING
Colleges of Engineering and Agriculture

GRADUATE FACULTY 1993-94

Chairman: O. J. Loewer. *Assistant Chairman:* R. C. Fluck. *Graduate Coordinator:* K. V. Chau. *Graduate Research Professor:* R. M. Peart. *Professors:* L. O. Bagnall; W. J. Becker; K. L. Campbell; K. V. Chau; D. P. Chynoweth; R. C. Fluck; J. W. Jones; O. J. Loewer; W. M. Miller; J. W. Mishoe; R. A. Nordstedt; A. R. Overman; D. R. Price; L. N. Shaw; S. F. Shih; A. G. Smajstrla; A. A. Teixeira; J. D. Whitney; F. S. Zazueta. *Associate Professors:* B. J. Boman; R. A. Bucklin; G. A. Clark; J. F. Earle; B. T. French; D. Z. Haman; R. C. Harrell; F. T. Izuno; P. H. Jones; E. P. Lincoln; M. Salyani; G. H. Smerage; M. T. Talbot; D. G. Watson; J. C. Webb. *Assistant Professors:* H. W. Beck; W. D. Graham.

The degrees of Master of Science, Master of Engineering, Doctor of Philosophy, and Engineer are offered with graduate programs in agricultural engineering through the College of Engineering. The Master of Science and Doctor of Philosophy degrees in agricultural engineering are offered in the area of agricultural operations management through the College of Agriculture.

The Master of Science, Master of Engineering, and Doctor of Philosophy degrees are offered in the following areas of research: soil and water conservation engineering, water resource quality management, waste management, power and machinery, structures and environment, agricultural robotics, crop processing, remote sensing, decision support systems, food and bioprocess engineering, biomass production, biological system simulation, and energy conversion systems. Students can pursue a graduate specialization in food engineering through a cooperative program jointly administered with the Department of Food Science and Human Nutrition. Similar programs may be developed with other departments within the University.

The Master of Science and Doctor of Philosophy in the agricultural operations management area of specialization provide for scientific training and research in technical agricultural management. Typical plans of study focus on advanced training in field production management, process and manufacturing management, or technical sales and product support.

Requirements for admission into the Master of Engineering and Doctor of Philosophy degree programs in the College of Engineering are the completion of an approved undergraduate program in agricultural engineering or related engineering discipline. Admission into the Master of Science program in the College of Engineering requires completion of mathematics sequence through differential equations, 8 credits of general chemistry and 8 credits of general physics with calculus and laboratory or equivalent. Admission into the Doctor of Philosophy or the Master of Science in the College of Agriculture requires completion

of an approved undergraduate agricultural operations management program or equivalent and a working knowledge of a computer language. Students not meeting the stated admissions requirements may be accepted into a degree program, providing sufficient articulation courses are included in the program of study. Students interested in enrolling in a graduate program should contact the Graduate Coordinator.

Candidates for advanced degrees in engineering are required to take at least 12 credits from an approved list of major courses at the 5000 level or higher, with at least 6 credits of AGE courses at the 6000 level, exclusive of seminar and thesis research credits. Other courses are taken in applicable basic sciences and engineering to meet educational objectives and to comprise an integrated program as approved by the Department's Graduate Committee. Master's students are required to complete at least 3 credits of mathematics at the 5000 level or higher, and doctoral students are required to complete at least 12 credits.

Candidates for the Master of Science concentration in agricultural operations management are required to complete AOM 6312, at least 12 credits from an approved list of major courses, at least 3 credits of statistics at the 6000 level, and at least 2 credits of applied systems or computer programming at the 5000 level or higher.

Prerequisite for admission to any graduate course is generally an undergraduate degree in agricultural engineering or related engineering discipline.

For students in a Master of Science program in the college of Agriculture, the following courses are acceptable: ACG 5005—Financial Accounting; ACG 6367—Managerial Accounting; AEB 6553—Elements of Econometrics; CAP 5009—Computer Concepts in Business; CAP 5021—Computer-Based Business Management.

AGE 5152—Advanced Power and Machinery for Agriculture (3) Functional design requirements, design procedures, and performance evaluation.

AGE 5332—Advanced Agricultural Structures (3) Design criteria for agricultural structures including steady and unsteady heat transfer analysis, environmental modification, plant and animal physiology, and structural systems analysis.

AGE 5442—Advanced Agricultural Process Engineering (3) Engineering problems in handling and processing agricultural products.

AGE 5643C—Biological and Agricultural Systems Analysis (3) *Prereq: MAC 3312.* Introduction to concepts and methods of process-based modeling of systems and analysis of system behavior; physiological, populational, and agricultural applications.

AGE 5646C—Biological and Agricultural Systems Simulation (3) *Prereq: MAC 3312, COP 3110 or 3212.* Numerical techniques for continuous system models using FORTRAN. Introduction to discrete simulation. Application of simulation and sensitivity analysis with examples relating to crops, soil, environment, and pests.

AGE 5647—Advances in Microirrigation (3) *Prereq: graduate status or consent of instructor.* State of the art in microirrigation technology. System evolution; components; soil-water-plant relations; hydraulics; design criteria; installation; water and chemical interactions; biological interactions; scheduling, operation and maintenance; knowledge-based systems; automation.

AGE 5707C—Agricultural Waste Management (3) Engineering analysis and design of systems for the collection, storage, treatment, transport, and utilization of livestock and other agricultural organic wastes and wastewaters. Field trips to operating systems and laboratory evaluation of materials and processes.

AGE 6031—Instrumentation in Agricultural Engineering Research (3) Principles and application of measuring instruments and devices for obtaining experimental data in agricultural engineering research.

AGE 6252—Advanced Soil and Water Management Engineering (3) Physical and mathematical analysis of problems in infiltration, drainage, and groundwater hydraulics.

AGE 6254—Simulation of Agricultural Watershed Systems (3) *Prereq: CWR 4101C and working knowledge of FORTRAN.* Characterization and simulation of agricultural watershed systems including land and channel phase hydrologic processes and pollutant transport processes. Investigation of the structure and capabilities of current agricultural watershed computer models.

AGE 6262C—Remote Sensing in Hydrology (3) Applications of satellites, shuttle imaging radar, ground-penetrating radar, multispectral scanner, thermal IR, and geographic information system to study rainfall, evapotranspiration, groundwater, water extent, water quality, soil moisture, and runoff.

AGE 6615—Advanced Heat and Mass Transfer in Biological Systems (3) *Prereq: CG5 3422, AGE 3612C.* Analytical and numerical technique solutions to problems of heat and mass transfer in biological systems. Emphasis on nonhomogenous, irregularly shaped products with respiration and transpiration.

AGE 6644—Agricultural Decision Systems (3) Computerized decision systems for agriculture. Expert systems, decision support systems, simulations, and types of applications in agriculture.

AGE 6905—Individual Work in Agricultural Engineering (1-4; max: 6) Special problems in agricultural engineering.

AGE 6910—Supervised Research (1-5; max: 5) S/U.

AGE 6931—Seminar (1; max: 2) Discussions of research, current trends, and practices in agriculture engineering. S/U.

AGE 6933—Special Topics in Agricultural Engineering (1-4; max: 6) Lectures, laboratory, and/or special projects covering special topics in agricultural engineering.

AGE 6940—Supervised Teaching (1-5; max: 5) S/U.

AGE 6971—Research for Master's Thesis (1-15) S/U.

AGE 6972—Research for Engineer's Thesis (1-15) S/U.

AGE 6986—Applied Mathematics in Agricultural Engineering (3) Mathematical methods, including regression analysis, graphical techniques, and analytical and numerical solution of ordinary and partial differential equations, relevant to agricultural engineering.

AGE 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.

AGE 7980—Research for Doctoral Dissertation (1-15) S/U.

AOM 5045—Appropriate Technology for Agricultural Mechanization (3) *Prereq: baccalaureate degree in agriculture or equivalent.* Selection, evaluation, and transfer of appropriate mechanization technology for agricultural development. Agricultural power sources; field, processing, transportation, water pumping, and other farmstead equipment and structures.

AOM 6315—Advanced Farm Machinery Management (3) *Prereq: AOM 3312; COP 3110 or consent of instructor.* The functional and economic applications of machine monitoring and robotics. Analysis of farm machinery systems reliability performance. Queueing theory, linear programming, and ergonomic considerations for machine systems optimization.

CWR 6536—Stochastic Subsurface Hydrology (3) *Prereq: senior-level course in probability and statistics, calculus through differential equations, soil physics, and/or subsurface hydrology.* Stochastic modeling of subsurface flow and transport including geostatistics, time series analysis, Kalman filtering, and physically based stochastic models.

CWR 6537—Contaminant Subsurface Hydrology (3) *Prereq: MAP 3302 or 4314 or equivalent; COP 3210 or equivalent; SOS 4602 or AGE 6252 or CWR 5125 or 5127 or equivalent; SOS 4404 or EES 6208 or equivalent.* Physical-chemical-biological concepts and modeling of retention and transport of water and solutes in unsaturated and saturated media. Applications to environmental aspects of soil and groundwater contamination emphasized.

AGRICULTURE—GENERAL
College of Agriculture

Dean: L. C. Connor. *Assistant Dean:* J. L. Fry.

The College of Agriculture offers academic programs and grants advanced degrees in 16 departments and the School of Forest Resources and Conservation. These academic units are all a part of the Institute of Food and Agricultural Sciences (IFAS). Additional components of IFAS include 16 research centers located throughout the state and cooperative extension offices in each of the 67 counties of the state.

The following courses are offered under the supervision of the office of the dean by an interdisciplinary faculty and deal with material of concern to two or more IFAS academic units. The courses are also open to students of other colleges, with the permission of the course instructor.

AGG 5425—Sustainable Agriculture (3) Growing global demands for agricultural products and sustainable methods for meeting, i.e., without degrading environment and natural resource base.
AGG 5505—Plant Protection in Tropical Ecosystems (4) Concepts of farming systems, integrated pest management and the design of viable plant protection strategies in human and agricultural systems of the worldwide tropics. Comparison of acceptable methods of managing pest organisms.
AGG 5813—Farming Systems Research and Extension Methods (3) Multidisciplinary team approach to technology generation and promotion with emphasis on small farms. Adaptations of anthropological, agronomic, and economic methods. Field work required.
AGG 5905—Individual Study (1-4; max: 6) Supervised study or research not covered by other courses.
AGG 5932—Special Topics (1-4; max: 6)
AGG 6830—Grant Writing for Agriculture and Natural Resources (2) *Prereq: admitted to doctoral program.* Preparation, submission, and management of competitive grants, including operations of national review panels and finding sources of extramural funding.
AGG 6933—Topics in Tropical Managed Ecosystems (2-8; max: 12) Intensive field research in ecology of agricultural production systems in the tropics. Interactions between human dominated systems, particularly agricultural systems, and natural ecosystems. Emphasis on acquiring and applying field research techniques.
HOE 5555—Women and Households in Agricultural Development (3) Women's roles in agricultural households, emphasis on farming systems in developing countries.

AGRONOMY
College of Agriculture

GRADUATE FACULTY 1993-94

Interim Chairman: J. M. Bennett. *Graduate Coordinator:* K. H. Quesenberry. *Professors:* L. H. Allen, Jr.; R. D. Barnett; J. M. Bennett; K. J. Boote; A. E. Dudeck; J. R. Edwardson; R. N. Gallaher; D. W. Gorbet; W. T. Haller; K. Hinson; J. C. Joyce; R. S. Kalmbacher; A. E. Kretschmer, Jr.; P. Mislevy III; P. L. Pfahler; H. L. Popenoe; G. M. Prine; K. H. Quesenberry; S. C. Schank; T. R. Sinclair; R. L. Smith; I. D. Teare; S. H. West; E. B. Whitty; M. Wilcox; D. L. Wright. *Associate Professors:* D. L. Anderson; B. J. Brecke; C. G. Chambliss; P. S. Chourey; D. L. Colvin; C. W. Deren; L. S. Dunavin; E. C. French; C. K. Hiebsch; D. B. Jones; K. A. Langeland; F. le Grand; J. D. Miller; W. D. Pitman; D. G. Shilling; L. E. Sollenberger; R. L. Stanley; D. L. Sutton; D. S. Wofford. *Assistant Professors:* K. L. Buhr; R. G. Shatters, Jr.; M. J. Williams.

The Department offers the Doctor of Philosophy and the Master of Science degrees in agronomy with specialization in crop ecology, crop nutrition and physiology, crop production, weed science, genetics, cytogenetics, or plant breeding. A nonthesis degree, Master of Agriculture, is offered with a major in agronomy.

Graduate programs emphasize the development and subsequent application of basic principles in each specialization to agronomic plants in Florida and throughout the tropics. The continuing need for increased food supplies is reflected in departmental research efforts. When compatible with a student's program and permitted by prevailing circumstances, some thesis and dissertation research may be conducted wholly or in part in one or more of several tropical countries.

A science background with basic courses in mathematics, chemistry, botany, microbiology, and physics is required of new graduate students. In addition to graduate courses in agonomy, the following courses in related areas are acceptable for graduate credits as part of the student's major: AGE 5643C— Biological and Agricultural Systems Analysis; AGE 5646—Biological and Agricultural Systems Simulation; ANS 6368—Quantitative Genetics; ANS 6388—Genetics of Animal Improvement; ANS 6452—Principles of Forage Quality Evaluation; ANS 6715—The Rumen and Its Microbes; BOT 5225C—Plant Anatomy; BOT 6516—Plant Metabolism; BOT 6526—Plant Nutrition; BOT 6566—Plant Growth and Development; HOS 6201—Breeding Perennial Cultivars; HOS 6231—Biochemical Genetics of Higher Plants; HOS 6242—Genetics and Breeding of Vegetable Crops; HOS 6345—Environmental Physiology of Horticultural Crops; PCB 5307—Limnology; PCB 6356C—Ecosystems of the Tropics; SOS 6136—Soil Fertility.

AGR 5266C—Field Plot Techniques (3) *Prereq: STA 3023.* Techniques and procedures employed in the design and analysis of field plot, greenhouse, and laboratory research experiments. Application of research methodology, the analysis and interpretation of research results.
AGR 5277C—Tropical Crop Production (3) *Prereq: consent of instructor.* The ecology and production practices of selected crops grown in the tropics.
AGR 5307—Molecular Genetics for Crop Improvement (2) *Prereq: AGR 3303, 4321, or ASG 3313.* Overview of molecular genetics and plant transformation methodologies used in crop improvement.
AGR 6233—Tropical Pasture and Forage Science (4) *Prereq: AGR 4231 and ANS 5446, or consent of instructor.* Potential of natural grasslands of tropical and subtropical regions. Development of improved pastures and forages and their utilization in livestock production.
AGR 6237—Agronomic Methods of Forage Evaluation (3) *Prereq or coreq: STA 6167.* Experimental techniques for field evaluation of forage plants. Design of grazing trials and procedures for estimating yield and botanical composition in the grazed and ungrazed pasture.
AGR 6311—Population Genetics (2) *Prereq: AGR 3303, STA 6166.* Application of statistical principles to biological populations in relation to gene frequency, zygotic frequency, mating systems, and the effects of selection, mutation and migration on equilibrium populations.
AGR 6323—Advanced Plant Breeding (3) *Prereq: AGR 3303, 4321, 6311, and STA 6167.* Theory and use of biometrical genetic models for analytical evaluation of qualitative and quantitative characteristics, with procedures applicable to various types of plant species.
AGR 6325L—Plant Breeding Techniques (1; max: 2) *Prereq: AGR 4321 or equivalent; coreq: AGR 6323 or equivalent.* Examination of various breeding techniques used by agronomic and horticultural crop breeders in Florida. Field and lab visits to active plant

breeding programs, with discussion led by a specific breeder each week. Hands-on experience in breeding programs.

AGR 6353—Cytogenetics (3) *Prereq: basic courses in genetics and cytology.* Genetic variability with emphasis on interrelationships of cytologic and genetic concepts. Chromosome structure and number, chromosomal aberrations, apomixis, and application of cytogenetic principles.

AGR 6422C—Crop Nutrition (3) *Preq: BOT 3503C.* Nutritional influences on differentiation, composition, growth, and yield of agronomic plants.

AGR 6442C—Physiology of Agronomic Plants (4) *Prereq: BOT 3503C or 5505C.* Yield potentials of crops as influenced by photosynthetic efficiencies, respiration, translocation, drought, and canopy architecture.

AGR 6511—Crop Ecology (4) *Prereq: AGR 4210, BOT 3503C, PCB 3043C, or equivalent.* Relationships of ecological factors and climatic classifications to agroecosystems, and crop modeling of the major crops.

AGR 6661C—Sugarcane Processing Technology (2) *Prereq: CHM 3200, 3200L.* Chemical and physical processes required for crystallization and refining of sugar.

AGR 6905—Agronomic Problems (1-5; max: 8) *Prereq: minimum of one undergraduate course in agronomy or plant science.* Special topics for classroom, library, laboratory, or field studies of agronomic plants. H.

AGR 6910—Supervised Research (1-5; max: 5) S/U.

AGR 6932—Topics in Agronomy (1-3; max: 8) Critical review of selected topics in specific agronomic areas.

AGR 6933—Graduate Agronomy Seminar (1; max: 3) *Required of all graduate students in agronomy.* Current literature and agronomic developments.

AGR 6940—Supervised Teaching (1-5; max: 5) S/U.

AGR 6971—Research for Master's Thesis (1-15) S/U.

AGR 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.

AGR 7980—Research for Doctoral Dissertation (1-15) S/U.

PLS 5652—Herbicide Technology (3) *Prereq: CHM 3200, PLS 4601, or consent of the instructor.* Classification, mode of action, principles of selectivity, and plant responses to herbicides. Weed, crop, environmental, and pest management associations in developing herbicide programs.

PLS 6623—Weed Ecology (2) *Prereq: PCB 3033C and PLS 4601, or equivalent.* Environmental influences on behavior and control of weeds; influences of common methods of weed control on the environment.

PLS 6655—Plant/Herbicide Interaction (3) *Prereq: introductory plant physiology and biochemistry; introductory weed control and knowledge of herbicide families.* Herbicide activity on plants: edaphic and environmental influences, absorption and translocation, response of specific physiological and biochemical processes as related to herbicide mode of action.

ANATOMY AND CELL BIOLOGY
College of Medicine

GRADUATE FACULTY 1993-94

Chairman: M. H. Ross. *Graduate Coordinator:* G. S. Bennett. *Professors:* C. M. Feldherr; K. A. Holbrook; L. H. Larkin; L. J. Romrell; M. H. Ross; C. C. Tisher; R. A. Wallace. *Scientist:* G. S. Bennett. *Associate Professors:* W. A. Dunn, Jr.; T. G. Hollinger; P. J. Linser; K. M. Madsen; K. E. Rarey; K. E. Selman; C. M. West. *Assistant Professors:* J. P. Aris; M. R. Paddy.

The Department of Anatomy and Cell Biology offers a program leading to the Doctor of Philosophy degree in the medical sciences with specialization in cell and developmental biology. The core curriculum provides instruction in these fields including related areas of molecular biology. Training is also offered in structural approaches to cell biology utilizing light and electron optics, including advanced state-of-the-art, three-dimensional digital methods, confocal optical microscopy, digital image processing, and computer graphics. The Department is a founding member of the new campuswide Center for Structural Biology.

Specific areas of research include protein turnover, modification, transport and localization, cell interactions in development, cell proliferation, intercellular adhesion, extracellular matrix, secretion, cytoskeleton, nuclear structure and function, cell-surface receptor-ligand events, endocytosis, regulation of renal transport and aspects of reproductive biology.

Applicants should have a strong background in biology, chemistry, or physics and have taken undergraduate courses in organic chemistry, calculus, physics, cell biology, and biochemistry. Deficiencies may be remedied during the first year of graduate study. The Department does not accept students into a program of study leading to the degree of Master of Science.

GMS 5621—Cell Biology (4) *Prereq: undergraduate biochemistry or cell biology or consent of instructor.* Fundamental mechanisms of cell functions, specializations, and interactions that account for the organization and activities of basic tissues.

GMS 5630—Microscopic Anatomy (4) The microscopic structure of the cells, tissues, and organs of the human body is taught. Correlation of structure to function is emphasized.

GMS 5641—Advanced Developmental Biology (4) *Prereq: developmental biology (or embryology), cell biology, and biochemistry, or consent of instructor; Coreq: molecular biology or consent of instruction.* Examination of developmental mechanisms in contemporary model systems, emphasis on experimental basis of knowledge. Exploration of development from differential gene expression to cellular mechanisms of pattern formation and morphogenesis.

GMS 5600C—Medical Human Anatomy (8) Basic structure and mechanics of the human body taught primarily in the laboratory but supplemented with lectures, conferences, and demonstrations as needed.

GMS 6609—Advanced Gross Anatomy (2-4; max: 6) Regional and specialized anatomy of the human body taught by laboratory dissection, conferences, and demonstrations.

GMS 6611—Research Methods in Cell Biology and Anatomy (1-4; max: 6) Research under supervision of staff member; student exposed to various research techniques available within the department.

GMS 6631—Advanced Tissue Biology (4) *Prereq: GMS 5621 or consent of instructor.* Microscopic anatomy, cell biology, and embryology of mammalian (mainly human) cells, tissues, and organs. Structure-function relationships and experimental approaches stressed. Histology laboratory included.

GMS 6632—Histochemical and Cytochemical Techniques (2) *Prereq: microscopic anatomy and staff approval.* The theory and use of histochemical and cytochemical techniques will be presented with lecture and laboratory exercises.

GMS 6690—Cell Biology and Anatomy Seminar (1; max: 12) Faculty-student discussions of research papers and topics.

GMS 6691—Special Topics in Cell Biology and Anatomy (1-4; max: 10) Readings in recent research literature of anatomy and/or allied disciplines including cell, developmental, and reproductive biology.

GMS 6970—Individual Study (1-3; max: 8) Supervised study in areas not covered by other graduate courses.

GMS 6971—Research for Master's Thesis (1-15) S/U.

GMS 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.

GMS 7980—Research for Doctoral Dissertation (1-15) S/U.

ANIMAL SCIENCE
College of Agriculture

GRADUATE FACULTY 1993-94

Chairman: F. G. Hembry. *Graduate Coordinator:* J. H. Conrad. *Graduate Research Professors:* R. H. Harms; W. W. Thatcher. *Professors:* C. B. Ammerman; D. K. Beede; M. J. Burridge; D. D. Buss; P. T. Cardeilhac; C. D. Chen; J. H. Conrad; C. H. Courtney; B. L. Damron; M. Drost; M. J. Fields; D. J. Forrester; J. L. Fry; K. N. Gelatt; E. P. Gibbs; R. R. Gronwall; P. J. Hansen; D. D. Hargrove; H. H. Head; L. R. McDowell; A. M. Merritt; R. D. Miles; J. E. Moore; R. P. Natzke; J. T. Neilson; E. A. Ott; F. M. Pate; D. C. Sharp, III; H. H. Van Horn, Jr.; A. I. Webb; R. L. West; C. J. Wilcox; H. R. Wilson. *Associate Professors:* R. L. Asquith; D. B. Bates; J. H. Brendemuhl; W. E. Brown; M. A. DeLorenzo; M. A. Elzo; A. C. Hammond; D. D. Johnson; E. L. Johnson; W. E. Kunkle; F. W. Leak; S. Lieb; T. T. Marshall; F. B. Mather; R. O. Myer; T. A. Olson; P. J. Prichard; R. S. Sand; F. A. Simmen; R. C. Simmen; C. R. Staples; S. H. Tenbroeck; C. E. White. *Assistant Professors:* C. C. Chase; S. K. Williams.

The Department of Animal Science offers the degrees of Master of Agriculture, Master of Science, and Doctor of Philosophy in the following concentrations: (1) animal nutrition, (2) meats, (3) animal breeding and genetics, and (4) animal physiology. A student may work on a problem covering more than one area of study. Large animals (beef cattle, dairy cattle, swine, poultry, and sheep) and laboratory animals are available for various research problems. Adequate nutrition and meats laboratories are available for detailed chemical and carcass quality evaluations. Special arrangements may be made to conduct research problems at the various branch agricultural experiment stations throughout Florida. A Ph.D. degree may be obtained in animal science, with dissertation research under the direction of members of the Departments of Dairy Science, Poultry Science, or Animal Science, or the College of Veterinary Medicine who have been appointed to the animal science doctoral research faculty.

Departmental prerequisites for admission to graduate study include a sound science background, with basic courses in bacteriology, biology, mathematics, botany, and chemistry.

The following courses in related areas will be acceptable for graduate credit as part of the candidate's major: AGR 6233—Tropical Pastures and Forage Science; AGR 6307—Advanced Genetics; AGR 6311—Population Genetics; AGR 6353—Cytogenetics; DAS 6281—Dairy Science Research Techniques; DAS 6322—Introduction to Statistical Genetics; DAS 6512C—Advanced Physiology of Lactation; DAS 6531—Endocrinology; DAS 6541—Energy Metabolism; FOS 6226C—Advanced Food Microbiology; FOS 6315C—Food Chemistry; PSE 6415—Advanced Poultry Nutrition; PSE 6522—Avian Physiology; VME 5242C—Physiology of Body Fluids.

ANS 5446—Animal Nutrition (3) *Prereq: ASG 3402C, BCH 3023 or permission of instructor.* Carbohydrates, fats, proteins, minerals, and vitamins and their functions in the animal body.

ANS 6288—Experimental Technics and Analytical Procedures in Meat Research (3) Experimental design, analytical procedures; technics; carcass measurements and analyses as related to livestock production and meats studies.

ANS 6368—Quantitative Genetics (3) *Prereq: STA 6166.* Genetics and biometric principles underlying genetic characters that exhibit continuous variation.

ANS 6386—Advanced Animal Breeding (3) *Prereq: permission of instructor.* Application of statistical procedures to the genetic evaluation of animals. Single trait evaluation. Multiple trait evaluation. Multibreed evaluation.

ANS 6388—Genetics of Animal Improvement (3) *Prereq: ANS 6368.* Application of statistical techniques and design in animal breeding research.

ANS 6448—Nitrogen and Energy in Animal Nutrition (3) *Prereq: CHM 3210.* Utilization of dietary nitrogen and energy sources by ruminants with comparative information on other species.

ANS 6452—Principles of Forage Quality Evaluation (2) *Prereq: ANS 5446, AGR 4231C.* Definition of forage quality in terms of animal performance, methodology used in forage evaluation, and proper interpretation of forage evaluation data.

ANS 6458—Advanced Methods in Nutrition Technology (3) *Prereq: CHM 2043. For graduate students but open to seniors by special permission.* Demonstrations and limited performance of procedures used in nutrition research.

ANS 6472—Vitamins (3) *Prereq: organic chemistry.* Historical development, properties, assays, and physiological effects.

ANS 6636—Meat Technology (3) Chemistry, physics, histology, bacteriology, and engineering involved in the handling, processing, manufacturing, preservation, storage, distribution, and utilization of meat.

ANS 6711—Equine Nutrition and Physiology (3) *Prereq: ANS 5446.* Principles affecting absorption and assimilation of nutrients and basic physiology of growth, reproduction, and exercise of the horse.

ANS 6715—The Rumen and Its Microbes (3) *Prereq: BCH 4003, ANS 5446.* Review and correlation of the fundamental biochemical, physiological, and bacteriological research upon which the feeding of ruminants is based. Experimental methodology of rumen physiology and metabolism.

ANS 6721—Swine Nutrition (2) *Prereq: ANS 5446.* Basic principles affecting absorption and assimilation of nutrients required for growth, reproduction, and lactation of swine.

ANS 6723—Mineral Nutrition and Metabolism (3) Physiological effect of macro- and micro-elements, mineral interrelationships.

ANS 6751—Physiology of Reproduction (3) *Prereq: VME 5242C, ASG 4334.* The interactions between the hypothalamus, pituitary gland, and reproductive organs during the estrous cycle and pregnancy in the female and sperm production in the male. Embryonic and placental development from fertilization through parturition and factors affecting reproductive efficiency.

ANS 6767—Molecular Endocrinology (3) *Prereq: 4024 or equivalent or permission of instructor.* Molecular basis of hormone action and regulation, and emerging techniques in endocrine system study; emphasis on molecular mechanisms of growth, development, and reproduction.

ANS 6905—Problems in Animal Science (1-4; max: 8) H.

ANS 6910—Supervised Research (1-5; max: 5) S/U.

ANS 6932—Topics in Animal Science (1-3; max: 9) New developments in animal nutrition and livestock feeding, animal genetics, animal physiology, and livestock management.

ANS 6933—Graduate Seminar in Animal Science (1; max: 8)

ANS 6940—Supervised Teaching (1-5; max: 5) S/U.

ANS 6971—Research for Master's Thesis (1-15) S/U.

ANS 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.

ANS 7980—Research for Doctoral Dissertation (1-15) S/U.

ANIMAL SCIENCE—GENERAL
College of Agriculture

The Departments of Animal, Poultry, and Dairy Science have combined their curricula into an animal science curriculum. ASG 5221 is a cross-departmental course taught by the faculty of the three departments.

ASG 5221—Animal Production in the Tropics (3) *Prereq: ANS 4242C, 4264C, DAS 3211, or permission of the instructor.* Management and environment factors which affect animal production in the tropics.

ANTHROPOLOGY
College of Liberal Arts and Sciences

GRADUATE FACULTY 1993-94

Chairperson: J. H. Moore. *Graduate Coordinator:* G. F. Murray. *Graduate Research Professor:* M. Harris. *Distinguished Service Professor:* P. L. Doughty. *Professors:* H. R. Bernard; A. F. Burns; R. Cohen; K. Deagan; M. C. Dougherty; P. L. Doughty; B. M. du Toit; J. D. Early;† E. M. Eddy *(Emeritus);* S. Feierman; C. F. Gladwin; B. T. Grindal;* M. J. Hardman-de-Bautista; M. Y. Iscan;† P. J. Magnarella; W. R. Maples; M. L. Margolis; J. T. Milanich; J. H. Moore; M. Moseley; A. R. Oliver-Smith; J. A. Paredes;* B. A. Purdy *(Emeritus);* H. I. Safa; M. Schmink; A. Springs; A. M. Stearman; O. von Mering; G. Weiss;† E. S. Wing. *Associate Professors:* S. A. Brandt; A. Hansen; T. Ho;* W. F. Keegan; W. J. Kennedy;† L. S. Lieberman; G. F. Murray; M. E. Pohl;* P. R. Schmidt.

These members of the faculty of Florida State University (*) and Florida Atlantic University (†) are also members of the graduate faculty of the University of Florida and participate in the doctoral degree program in the University of Florida Department of Anthropology.

The Department of Anthropology offers graduate work leading to the Master of Arts (thesis or nonthesis option) and Doctor of Philosophy degrees. Graduate training is offered in applied anthropology, social and cultural anthropology, archeology, anthropological linguistics, and physical/biological anthropology.

There is a general option and an interdisciplinary one. The general option allows students to concentrate at the M.A. level on the integration of the four subfields of anthropology and to specialize at the Ph.D. level. The interdisciplinary alternative allows students to 1) concentrate on one or two subfields of anthropology along with one or more areas outside of anthropology and 2) begin early specialization and integration of a subfield of anthropology and an outside field. More information about these two options is found in the Department publication on graduate programs and policies that may be obtained by writing directly to the Department.

The Department of Anthropology generally requires a minimum score of 1100 on the Graduate Record Examination and a 3.2 overall grade point average based on a 4.0 system.

Candidates for the M.A. are required to take ANT 6038 and 6917. No more than six hours of ANT 6971 will be counted toward the minimum requirements for the M.A. with thesis. Knowledge of a foreign language may be required by the student's supervisory committee. Other requirements for the program are listed in this *Catalog* under the *Requirements for Master's Degrees.*

Students enrolled in the M.A. program who wish to continue their studies for a Ph.D. must apply to the Department for certification. Minimum requirements will normally include 1) a minimum grade point average of 3.5 in all graduate anthropology courses and a minimum of 3.2 in other courses, 2) a grade of pass on either the Integrative Basic Knowledge Examination or the comprehensive examination, and 3) a thesis, report, or paper judged to be of excellent quality by the student's supervisory committee. In most cases, candidates for the Ph.D. must achieve competency in a language other than English. Entering students who already have earned a master's degree may apply for direct admission to the doctoral program.

Study for the Ph.D. degree in anthropology at the University of Florida by qualified master's degree recipients at Florida Atlantic University and Florida State University is facilitated by a cooperative arrangement in which appropriate faculty members of these universities are members of the graduate faculty of the University of Florida.

There are two deadlines for receiving completed applications for admission into the graduate program. November 1 (for spring semester admissions) and March 11 (for fall and summer semester admissions).

ANT 5115—Archeological Theory (3) *Prereq: one course in archeology; and/or anthropology or permission of the instructor.* Survey of the theoretical and methodological tenets of anthropological archeology; critical review of archeological theories, past and present; relation of archeology to anthropology. Not open to students who have taken ANT 4110.

ANT 5126L—Field Sessions in Archeology (6) *Prereq: 6 hours of anthropology or permission of instructor.* Excavation of archeological sites, recording data, laboratory handling and analysis of specimens, and study of theoretical principles which underlie field methods and artifact analysis. Not open to students who have taken ANT 4124 or equivalent.

ANT 5127—Laboratory Training in Archeology (3) *Prereq: an introductory level archeology course.* Processing of data recovered in field excavations; cleaning, identification, cataloging, classification, drawing, analysis, responsibilities of data reporting. Not open to students who have taken ANT 4123 or equivalent.

ANT 5154—North American Archeology (3) The existing archeological materials relating to prehistoric North American cultures. The origins of the North American Indian. Historic Indian and colonial materials. Not open to students who have taken ANT 3153.

ANT 5156—Southeastern United States Archeology (3) Survey of archeological materials relating to aboriginal occupation of the Southeastern United States from the Paleo-Indian period to the historic horizon. Sites, artifacts, and cultural adaptations in the Southeast.

ANT 5159—Florida Archeology (3) Survey of 12,000 years of human occupation of Florida, including early hunters and foragers, regional cultural developments, external relationships with the Southeast and Caribbean regions, peoples of historic period, and effects of European conquest. Not open to students who have taken ANT 3157.

ANT 5175—Historical Archeology (3) *Prereq: ANT 3141 or consent of instructor.* Methods and theoretical foundations of historical archeology as it relates to the disciplines of anthropology, history, historic preservation, and conservation. Introduction to pertinent aspects of material culture during the historic period.

ANT 5188—Conservation and Archaeometry (3) *Prereq: ANT 4185 or equivalent.* Treatment of artifacts from the time of excavation until permanent storage including field preservation, precaution processing storage, and preparation for inclusion in exhibits. Treatment of fragile artifacts.

ANT 5195—Zooarcheology (3) *Prereq: consent of instructor.* Human use of animal resources, with emphasis on prehistoric hunting and fishing practices. Origins of animal domestication.

ANT 5256—Rural Peoples in the Modern World (3) Historical background and comparative contemporary study of peasant and other rural societies. Unique characteristics, institutions, and problems of rural life stressing agriculture and rural-urban relationships in cross-cultural perspective. Not open to students who have taken ANT 4255.

ANT 5266—Economic Anthropology (3) Anthropological perspectives on economic philosophies and their behavioral bases. Studies of production, distribution, and consumption; money, savings, credit, peasant markets; and development in cross-cultural context from perspectives of cultural ecology, Marxism, formalism, and substantivism. Not open to students who have taken ANT 4266.

ANT 5267—Anthropology and Development (3) An examination of theories and development and their relevance to the Third World, particularly Africa or Latin America. After this microanalysis, microlevel development will be examined with special reference to rural areas.

ANT 5303—Women and Development (3) Influence of development on women in rural and urban areas. Women's participation in the new opportunities of modernization.

ANT 5317—The North American Indian (3) The peopling of North America. The culture areas of North America. Unique characteristics, institutions, and problems. Not open to students who have taken ANT 4312.

ANT 5326—Peoples of Mexico and Central America (3) The settlement and early cultures of the area with an emphasis on the rise of the major culture centers. The impact of European civilization on surviving Indians. Not open to students who have taken ANT 4326.

ANT 5327—Maya and Aztec Civilizations (3) Civilizations in Mesoamerica from the beginnings of agriculture to the time of the coming of Europeans. Maya and Aztec civilizations as well as the Olmec, Zapotec, and Teotihuacan cultures. Not open to students who have taken ANT 3325.

ANT 5336—The Peoples of Brazil (3) Ethnology of Brazil. Historical, geographic, and socioeconomic materials and representative monographs from the various regions of Brazil as well as the contribution of the Indian, Portuguese, and African to modern Brazilian culture. Not open to students who have taken ANT 4336.

ANT 5337—Peoples of the Andes (3) The area-cotradition. The Spanish Conquest and shaping and persistence of colonial culture. Twentieth-century communities—their social land tenure, religious, and value systems. Modernization, cultural pluralism, and problems of integration. Not open to students who have taken ANT 4337.

ANT 5338—The Tribal Peoples of Lowland South America (3) Survey of marginal and tropical forest hunters and gatherers and horticulturalists of the Amazon Basin, Central Brazil, Paraguay, Argentina, and other areas of South America. Social organization, subsistence activities, ecological adaptations, and other aspects of tribal life. Not open to students who have taken ANT 4338.

ANT 5339—The Inca and Their Ancestors (3) Evolution of the Inca empire traced archeologically through earlier Andean states and societies to the beginning of native civilization. Not open to students who have taken ANT 3164.

ANT 5346—Anthropology of the Caribbean (3) Transformation of area through slavery, colonialism, and independence movements. Contemporary political, economic, familial, folk-religious, and folk-healing systems. Migration strategies and future options. Not open to students who have taken ANT 4346.

ANT 5353—Peoples of Africa (3) Survey of the culture, history, and ethnographic background of the peoples of Africa. A basis for appreciation of current problems of acculturation, nationalism, and cultural survival and change among African peoples. Not open to students who have taken ANT 4352.

ANT 5354—The Anthropology of Modern Africa (3) Continuity and change in contemporary African societies, with special reference to cultural and ethnic factors in modern nations. Not open to students who taken ANT 4354.

ANT 5395—Visual Anthropology (3) *Prereq: basic knowledge of photography or permission of instructor.* Photography and film as tools and products of social science. Ways of describing, analyzing, and presenting behavior and cultural ideas through visual means, student projects, and laboratory work with visual anthropology. Not open to students who have taken ANT 3390.

ANT 5429—Kinship and Social Organization (3) *Prereq: ANT 2402 or 3410.* Property concepts, forms, and complexes. Tribal patterns of government and social control. Not open to students who have taken ANT 4426.

ANT 5465—Culture and Aging (3) *Prereq: two of following: ANT 3410, 5OC 2000, or introductory psychology course.* Cross-cultural perspectives of adult development and aging in traditional and industrial society. Comparative assessment of culturally mediated, life-cycle transformations into old age and health related and human service policy issues. Not open to students who have taken ANT 4464.

ANT 5467—Culture and Nutrition (3) *Prereq: HUN 3221.* The theory, methodology, and substantive material of nutritional anthropology. Emphasis on cross-cultural bio-behavioral patterns.

ANT 5477—Applied Anthropology (3) Survey of history, theory and practice of applying cultural anthropology to human issues and problems. Applications to international development, peace studies, health, education, agriculture, ethnic minority and human rights issues. Case review, including aspects of planning, consultancy work, evaluation research, and ethics.

ANT 5485—Research Design in Anthropology (3) Examination of empirical and logical basis of anthropological inquiry; analysis of theory construction, research design, problems of data collection, processing, and evaluation.

ANT 5486—Computing for Anthropologists (3) *Prereq: ANT 5485 or consent of instructor.* Practical introduction to computer. Collecting, organizing, processing, and interpreting numerical data on microcomputer. Data sets used correspond to participants' subfields.

ANT 5527—Human Osteology and Osteometry (3) *Prereq: ANT 3511 and consent of instructor.* Human skeletal identification for the physical anthropologist and archeologist. Techniques for estimating age at death, race, and sex from human skeletal remains. Measurement of human skeleton for comparative purposes. Not open to students who have taken ANT 4525.

ANT 5546—Seminar: Human Biology and Behavior (3) *Prereq: consent of instructor.* Social behavior among animals from the ethological-biological viewpoint; the evolution of animal societies; the relevance of the ethological approach for the study of human development.

ANT 5615—Language and Culture (3) Principles and problems of anthropological linguistics. The cross-cultural and comparative study of language. Primarily concerned with the study of non-Indo-European linguistic problems.

ANT 5624—Introduction to Anthropological Linguistic Field Methods (6) Field procedures, collections, and processing of language data.

ANT 5625—Anthropological Linguistics (3) *Prereq: ANT 3610.* Descriptive linguistics. Language structure and process especially related to describing, understanding, and analyzing non-Western languages. Not open to students who have taken ANT 4620.

ANT 5675—Laboratory Work in Anthropological Linguistics (1-3; max: 10)

ANT 6038—Seminar in Anthropological History and Theory (3) Theoretical principles and background of anthropology and its subfields.

ANT 6119—Problems in Caribbean Prehistory (3) Theories and methods for study of prehistoric human societies. Case studies drawn primarily from Caribbean islands.

ANT 6128—Lithic Technology (3) Flintworking techniques and uses of stone implements for two million years. Emphasis on stoneworking technology in prehistoric Florida.

ANT 6129—Ceramic Analysis (3) *Prereq: permission of instructor.* Properties and methods of analysis of clays and pottery. Ethnographic pottery making and problems of archeological ceramics. Laboratory exercises.

ANT 6186—Seminar in Archeology (3; max: 10) Selected topic.

ANT 6276—Principles of Political Anthropology (3) Problems of identifying political behavior. Natural leadership in tribal societies. Acephalous societies and republican structures. Kingship and early despotic states. Theories of bureaucracy. Not open to students who have taken ANT 4274.

ANT 6286—Seminar in Contemporary Theory (3; max: 10) Areas treated are North America, Central America, South America, Africa, Oceania.

ANT 6356—Peoples and Culture in Southern Africa (3) Prehistoric times through first contacts by explorers to settlers; the contact situation between European, Khoisan, and Bantu-speaking; empirical data dealing with present political, economic, social, and religious conditions.

ANT 6387—Seminar on the Anthropology of Latin America (3; max: 10) *Prereq: reading knowledge of Spanish or Portuguese and consent of instructional staff.* Major branches of anthropology.

ANT 6388—Ethnographic Field Methods (3) Methods of collecting ethnographic data. Entry into the field; role and image conflict. Participant observation, interviewing, content analysis, photography and documents, data retrieval, analysis of data.

ANT 6428—Culture and Community (3) *Prereq: 15 to 20 credits in social sciences.* Examination of the method and theory of the empirical, inductive, natural history approach in the study of communities. Existing community studies provide comparative analyses of social structure, culture patterns, and process of change.

ANT 6445—Seminar in African Studies (3) Current conditions and problems flowing from detribalization, acculturation, and urbanization. Changes in values, attitudes, and institutions, as well as the reaction among the peoples of Africa in the form of traditional survivals, cultural revivals, and innovations.
ANT 6447—Seminar in Urban Anthropology (3) *Prereq: consent of instructor.* Anthropological view of the city through interaction of spatial and temporal behavior, ecology, culture institutions, and urban morphology.
ANT 6487—Evolution of Culture (3) *Prereq: ANT 3141.* Theories of culture growth and evolution from cultural beginnings to dawn of history. Major inventions of man and their significance.
ANT 6547—Human Adaptation (3) *Prereq: ANT 3511 or permission of instructor.* An examination of adaptive processes—cultural, physiological, genetic—in past and contemporary populations.
ANT 6557—Primate Behavior (3) *Prereq: one course in either physical anthropology or biology.* Taxonomy, distribution, and ecology of primates. Range of primate behavior for each major taxonomic group explored.
ANT 6588—Seminar in Physical Anthropology (3; max: 10) Selected topic.
ANT 6589—Seminar in Evolutionary Theory, Human Evolution, and Primate Behavior (3) Theory of evolution as a framework to explore primate behavior and human micro- and macroevolution.
ANT 6619—Seminar in Language and Culture (3; max: 10) Selected topic.
ANT 6707—Seminar on Applied Anthropology (3) *Prereq: ANT 5477 or instructor's permission.* Consideration of planned sociocultural and technological change and development in the United States and abroad; special and cultural problems in the transferral of technologies; community development and aid programs. Comparative program evaluation.
ANT 6719—Anthropology and Evaluation Research (3) *Prereq: ANT 5485; and ANT 5477 or 6707.* Contemporary approaches to the evaluation of social programs.
ANT 6737—Medical Anthropology (3) *Prereq: consent of instructor.* Theory of anthropology as applied to nursing, medicine, hospital organization, and the therapeutic environment. Instrument design and techniques of material collection.
ANT 6905—Individual Work (1-3; max: 10) Guided readings on research in anthropology based on library, laboratory, or field work.
ANT 6910—Supervised Research (1-5; max: 5) S/U.
ANT 6915—Research Projects in Social, Cultural, and Applied Anthropology (1-3; max: 10) *Prereq: consent of instructor.* For students undertaking directed research in supplement to regular course work.
ANT 6917—The Profession of Anthropology (1) *Required of all graduate students.* Organizations of the anthropological profession in teaching and research. Relationship between subfields and related disciplines; the anthropological experience; ethics.
ANT 6933—Special Topics in Anthropology (1-3; max: 9) *Prereq: consent of instructor.*
ANT 6940—Supervised Teaching (1-5; max: 5) S/U.
ANT 6945—Internship in Applied Anthropology (1-8; max: 8) *Prereq: permission of graduate coordinator.* Required of all students registered in programs of applied anthropology. Students are expected to complete 4-8 hours.
ANT 6971—Research for Master's Thesis (1-15) S/U.
ANT 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.
ANT 7980—Research for Doctoral Dissertation (1-15) S/U.

ARCHITECTURE
College of Architecture

GRADUATE FACULTY 1993-94

Chairman: R. S. McCarter. *Graduate Coordinators:* G. D. Ridgdill; L. G. Shaw. *Professors:* A. J. Dasta; R. W. Haase; H. W. Kemp; R. S. McCarter; H. C. Merritt, Jr.; G. D. Ridgdill; L. G. Shaw; G. W. Siebein; B. F. Voichysonk; I. H. Winarsky. *Associate Professors:* F. Cappellari; C. B. Constant; M. T. Foster; M. G. Gundersen; O. W. Hill; R. M. MacLeod; C. F. Morgan; R. W. Pohlman; P. E. Prugh; K. Tanzer; K. S. Thorne; W. L. Tilson; T. R. White. *Assistant Professors:* P. Chomowicz; R. Garcia; A. Hofer; M. Kaul; S. Luoni; R. Witte. *Lecturers:* M. C. Cappellari; H. E. Shepard.

Master of Architecture.—The Department of Architecture offers graduate work leading to the first professional degree, Master of Architecture. During graduate studies, each student has the opportunity to focus on one or more areas, including design, history and theory, urban design, preservation, structures, and technology. The student's overall college experience, both undergraduate and graduate programs, is intended to be a complete unit of professional education leading to practice in architecture or related fields. Students entering the program at the University of Florida will matriculate in one of the following tracks:

Baccalaureate in Architecture Base.—For those students who have a four-year baccalaureate degree from an accredited architectural program and have completed 6 to 8 architecture studios, two years in residence (52 credits) are normally required for completion of the Master of Architecture degree; notification of program length is part of the letter of acceptance and is determined by portfolio and transcript review. ARC 6241, 6355, and 6356 are required of all graduate students in this track and are prerequisites for the required thesis or project. Course sequences in history and theory, technology, and structures must also be completed.

Baccalaureate in Related Degree Base.—For those students who have a baccalaureate degree with an architecture or related major (art, interior design, landscape architecture) and who have completed 4 or 6 architecture or design studies, three years of residence (83 credits, approximately) are normally required for completion of the Master of Architecture degree; notification of program length is part of the letter of acceptance and is determined by portfolio and transcript review. ARC 4073, 4074, 6355, and 6356 are required of all graduate students in this track and are prerequisites for the required thesis or project. (Undergraduate courses—3000 and 4000 level in the major do not count toward the minimum requirements for the graduate degree.) Course sequences in history and theory, materials and methods, technology, structures, and practice must be completed.

Baccalaureate in Nonrelated Degree Base.—For those students who have a baccalaureate degree in a nonrelated academic area and have completed less that 4 design studies courses, four years of residence (112 credits, approximately) are normally required for completion of the Master of Architecture degree; notification of program length is part of the letter of acceptance and is determined by portfolio and transcript review. (Summer introductory courses—such as design exploration offered by the Architecture Department—are strongly recommended.) ARC 4071, 4072, 4073, 4074, 6241, 6355, and 6356 are required of all graduate students in this track and are prerequisites for the required thesis or project. (Undergraduate courses—3000 and 4000 level—in the major do not count toward the minimum requirements for the graduate degree.) Course sequences in history and theory, materials and methods, technology, structures, and practice must be completed.

Accredited Five-Year Professional Base.—For those students holding a baccalaureate degree in architecture from an accredited five-year professional degree program, a one-year degree program is available. In these cases, a specialized curriculum which compliments the needs of the

applicant is developed. The minimum registration is 30 credits; however, it may increase if transcript reviews reveal further course work is needed to meet registration and curriculum requirements. ARC 6356 is required and is prerequisite for the required thesis or project.

Master of Science in Architectural Studies.—The M.S.A.S. is a nonprofessional degree for those students who wish to engage in advanced investigations in specialized areas of architectural history, theory, technology, design, preservation, or practice. Students with a bachelor's degree in any discipline from an accredited university are eligible to apply to this program; the proposed area of focus should be precisely defined in the application. This is normally a three-semester program (32 hours) which includes a thesis. (No more than six hours of ARC 6971 may be counted in the minimum credit hours for the degree.) Interdisciplinary study is encouraged.

The College of Architecture sponsors special curricula in architecture to enhance the academic program. *Preservation Institute: Caribbean, Preservation Institute: Nantucket, and Vicenza Institute for Architecture* accept students, not only from the University of Florida, but from academic circles throughout the United States and the world for year-round study. All students in graduate architecture programs at the University of Florida are offered the opportunity to apply for one or more of these programs.

Applications.—All applications for graduate admission, including official transcripts, GRE scores, and TOEFL scores, if necessary, must be received by the Office of the Registrar by January 15. In addition to satisfying University requirements for admission, applicants are required to submit to the Graduate Secretary, Department of Architecture, 231 ARCH, P.O. Box 115702, the following: a portfolio of their creative work; a scholarly statement of intent and objectives; and three letters of recommendation. This material must be received by January 15 to be considered for admission in the following fall semester. (Portfolio must be accompanied by self-addressed, stamped envelope.) Students may apply after the January 15 deadline but will only be considered if spaces become available. (Updates of portfolios are accepted after January 15; however, applications will not be considered until they are complete.)

The Department reserves the right to retain student work for purposes of record, exhibition, or instruction. Field trips are required of all students; students should plan to have adequate funds available. It may be necessary to assess studio fees to defray costs of base maps and other generally used materials.

Doctor of Philosophy.—The College of Architecture offers a program leading to the Doctor of Philosophy degree in architecture. Areas of specialization within this program include architecture, building construction, and urban and regional planning. For information, write to the Director, College of Architecture Doctoral Program, 331 ARCH, P.O. Box 115701.

ARC 5282—Estimating and Cost Control of Building (3) Cost estimating and control of design and construction processes; consideration of bidding for building projects.

ARC 5576—Architectural Structures (3) Final course in structures sequence. Analysis and behavior of reinforced concrete, prestress, masonry, foundations, steel, and suspension systems.

ARC 5791—Topics in Architectural History (3)

ARC 5800—Survey of Architectural Preservation, Restoration, and Reconstruction (3)

ARC 5810—Techniques of Architectural Documentation (3) Documentation, interpretation, and maintenance issues relating to historic structures.

ARC 5811—Historic Preservation and Restoration (3) Preservation of individual structures, with emphasis on architectural design for restoration, rehabilitation, and adaptive-use.

ARC 6176—Advanced Computer-Aided Design (3; max: 6) Focus on available hardware and software and their current and potential usefulness to the profession. Investigation of future directions in hardware and software development.

ARC 6241—Advanced Studio I (1-9; max: 9) *Required for all graduate students.* Architecture as function of human action (program and use) and potentials inherent in construction (structure and material); relationship between ritual and built form—culminating in a highly resolved spatial order.

ARC 6242—Research Methods (2) *Required of all graduate students.*

ARC 6280—Advanced Topics in Architectural Practice (3; max: 6) Contemporary practice models analyzed.

ARC 6281—Professional Practice (3) Principles and processes of office practice management, investment and financing, project phases, building cost estimation, contracts.

ARC 6355—Advanced Studio II (6) Relation between the tectonic and the experience of place; emphasis on the joint, the detail, the tactile reading of architecture—culminating in a highly resolved tectonic order.

ARC 6356—Advanced Studio III (6) Development of design methods for synthesizing specialized aspects of architectural practice such as human behavior and space programming, environmental control and energy use, structures and materials of construction, project management, preservation and reuse of historic structures, theoretical and philosophical areas of inquiry.

ARC 6357—Advanced Topics in Architectural Design (3; max: 6) Focus on expanding familiar concepts in conception and production of architecture. Examination of potential for program to generate architectonic form, bringing multidisciplinary approach to historical manifestations.

ARC 6391—Architecture, Energy, and Ecology (3) Integration of energetic and environmental influences on architectural design.

ARC 6393—Advanced Architectural Connections (3) An analysis of architectural connections and details relative to selected space, form, and structural systems.

ARC 6399—Advanced Topics in Urban Design (3; max: 6) Impact of cultural, sociological, economic, and technological transformations of both historic urban form and newly developed urban areas, special emphasis on impact of transportation, particularly the automobile.

ARC 6571—Advanced Architectural Structures III (3) Design and applications of precast and/or prestressed concrete elements in architecture.

ARC 6575—Advanced Architectural Structures IV (3) Study of various soil properties and their application in solving architectural design problems. Behavior of masonry bearing walls in high-rise construction.

ARC 6577—Advanced Architectural Structures I (3) Principles and application of timber construction to architectural design problems.

ARC 6578—Advanced Architectural Structures II (3) Theory and behavior of structural steel systems and their responses to the solution of architectural problems.

ARC 6611—Advanced Topics in Architectural Technology (3; max: 6) Focus on structures, materials, construction systems, or environmental technology. Examination of determination of architectural form by available technologies and inventions throughout history.

ARC 6633—Thermal Systems (3) Thermal issues in architecture including thermal comfort, passive and active thermal control systems, and energy efficiency.

ARC 6642—Architectural Acoustics Design Laboratory (3) *Coreq: ARC 6643.* Theory and practice of architectural acoustics in the solution to design problems.

ARC 6643—Architectural Acoustics (3) Theory, practice, and application of acoustics in architecture.

ARC 6653—Modeling Techniques in Architectural Acoustics (3) Theory and practice of ultrasonic, computer, and other techniques used to model human subjective response to sound and their application in the design of buildings.

ARC 6684—Lighting, Daylighting, and Electrical Power Systems (3) Design problems investigating the theory, practice, and applications of electric lighting, daylighting, and electrical power systems in architecture.

ARC 6685—Life Safety, Sanitation, and Plumbing Systems (3) Design problems investigating the theory, practice, and applications of fire safety, movement, sanitation, and plumbing systems in architecture.

ARC 6711—Architecture of the Ancient World (3) Key built works from Egyptian, Greek, Roman, and Meso-American civilizations. Emphasis on understanding both cultural context for these works and construction technologies utilized in their making. Examination of their use as ruins and their contemporary meanings.
ARC 6716—Architecture of the Romanesque and Gothic (3) Selected monuments from the Romanesque, Byzantine, and Gothic periods. Emphasis on cultural context, technology of construction, and experiential and spatial qualities. Relationship between religious aspirations and technical means, as captured in individual work.
ARC 6750—Architectural History: America (3) Development of American architecture and the determinants affecting its function, form, and expression.
ARC 6753—Architecture of the Orient (3) Selected built works from major historical periods, Islamic, Indian, Chinese, and Japanese civilizations. Emphasis on cultural context, construction technologies, and spatial and experiential ordering ideas. Relationship to and influence on western architecture.
ARC 6771—Architectural History: Literature and Criticism (3) Individual research with concentration on writing and architectural criticism.
ARC 6793—Architectural History: Regional (3) Group and individual studies of architecture unique to specific geographic regions.
ARC 6805—Architectural Conservation (3) A multidisciplinary study, supervised by an architectural professor and another professor from an appropriate second discipline, in the science of preserving historic architecture, utilizing individual projects.
ARC 6821—Preservation Problems and Processes (3) Preservation in the larger context. Establishing historic districts; procedures and architectural guidelines for their protection.
ARC 6822—Preservation Programming and Design (3) Architectural design focusing on compatibility within the fabric of historic districts and settings.
ARC 6823—Techniques of Preservation: Legal and Economic Processes (3)
ARC 6851—Technology of Preservation: Materials and Methods I (3) Materials, elements, tools, and personnel of traditional building.
ARC 6852—Technology of Preservation: Materials and Methods II (3) *Prereq: ARC 6851.*
ARC 6910—Supervised Research (1-5; max: 5) S/U.
ARC 6911—Architectural Research (1-6; max: 9) Special studies adjusted to individual needs. H.
ARC 6912—Architectural Research II (1-6; max: 9) Special studies adjusted to individual needs. H.
ARC 6913—Architectural Research III (1-6; max: 9) Special studies adjusted to individual needs. H.
ARC 6932—Advanced Topics in Architectural Methods (3; max: 6) Exploration of interconnection between architectural design and research methodology.
ARC 6940—Supervised Teaching (1-5; max: 5) S/U.
ARC 6971—Research for Master's Thesis (1-15) S/U.
ARC 6979—Master's Research Project (1-10) H.
ARC 7790—Doctoral Core I (3) Philosophy, theory, and history of inquiry into the processes of design, urban development, and building systems.
ARC 7792—Doctoral Core II (3) *Prereq: ARC 7790.* Urban, environmental, and legal systems in the context of urban development.
ARC 7794—Doctoral Seminar (1; max: 4) Current planning, architecture, development, and construction theories.
ARC 7911—Advanced Architectural Research I (3) *Prereq: STA 6167.* Architectural, planning, and construction research design with relevant mathematical and computer methods.
ARC 7912—Advanced Architectural Research II (3) *Prereq: ARC 7911.* Conduct of research in architecture, planning, and construction.
ARC 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.
ARC 7980—Research for Doctoral Dissertation (1-15) S/U.
URP 6272—Advanced Planning Information Systems (3) *Prereq: URP 6271.* Theoretical and practical knowledge about the structure, use, and architecture of georeference data base systems. Discussion of spatial relationships which exist between network and area-related systems. Development and maintenance of geographic information systems as related to urban and regional planning.

ART
College of Fine Arts

GRADUATE FACULTY 1993-94

Chairman: J. E. Catterall. *Graduate Coordinators:* M. E. Flannery (Art Education); R. E. Poyner (Art History); J. J. Sabatella (Art Studio). *Graduate Research Professor:* J. N. Uelsmann. *Distinguished Service Professor:* K. A. Kerslake. *Professors:* J. E. Catterall; M. J. Isaacson; J. C. Nichelson; J. A. O'Connor; J. J. Sabatella; R. C. Skelley; E. Y. Streetman; J. L. Ward; R. H. Westin; W. W. Wilson. *Associate Professors:* B. A. Barletta; J. L. Cutler; M. E. Flannery; R. C. Heipp; D. A. Kremgold; R. E. Poynor; D. C. Roland; J. F. Scott; N. S. Smith; D. J. Stanley; K. W. Valdes. *Assistant Professors:* R. Mueller; J. J. Schall; B. Slawson.

Master of Fine Arts Degree.—The Department offers the MFA degree in art with concentrations in ceramics, creative photography, drawing, painting, printmaking, sculpture, graphic design, electronic intermedia, and multi-media. Enrollment is competitive and limited. Candidates for admission should have adequate undergraduate training in art. Deficiencies may be corrected before beginning graduate study. Applicants must submit a portfolio by March 1 for fall admission. A minimum of three years residency is normally required for completion of the requirements for this degree, which for studio majors culminates with an MFA exhibition. The Department reserves the right to retain student work for purposes of record, exhibition, or instruction.

The MFA requires a minimum of 60 credit hours. ARH 6897 is required for all MFA majors. Twenty-four hours must be in an area of specialization which will be taken in the following sequence: ART 6926C, 6927C, 6928C, 6929C. Each class will be repeated as needed to achieve the appropriate number of credits. Twelve hours of studio electives, six hours of art history electives; three hours of aesthetics, theory, or criticism; six hours of electives; and six hours of individual project or thesis research comprise the normal course requirements. Although the MFA is a thesis degree, students usually produce a creative project in lieu of thesis. Students should see the Graduate Coordinator for Department requirements for the creative project. (If the student elects to write a thesis, he/she must discuss the reasons with the Graduate Coordinator and the supervisory committee during the second year and make appropriate modifications. ARH 5805 is required for all students who select the written thesis.)

Master of Arts Degree in Art Education.—The Department offers the M.A. in art education. In addition to meeting requirements of the Graduate School for admission, prospective students should (1) hold a degree in art, art history, or art education; (2) send a portfolio, which includes 35mm slides of works of art and a successful research paper, to the Department; (3) submit three letters of recommendation. The application deadline for fall admission is March 1.

The M.A. in art education requires a minimum of 36 credit hours. ARE 6047, 6141, and 6148 are required. The basic plan of study includes three credits of an approved art education elective; nine credits in studio courses; three credits in art history; six credits in art history, studio, art

education, or education electives; three credits of ARE 6705; and three credits of ARE 6971 or 6973. To be admitted to candidacy, students must pass a comprehensive examination at the beginning of the second year. The program culminates in an oral examination on the thesis or project in lieu of thesis.

Master of Arts Degree in Art History.—The Department offers the Master of Arts with emphasis in areas of Ancient, Medieval, Renaissance, Baroque, Modern, and Non-Western art history, including African, American Indian, Asian, Latin American, and Oceanic, and in museum studies.

A minimum of 37 credit hours is required: ARH 5805 (3 credits), 28 hours with at least one course in four areas of emphasis, and ARH 6971 (6 credits). Nine credits may be taken in related areas with the Graduate Coordinator's approval. Students with a museum studies emphasis will take 9 credits in the following areas: Seminar in Museum Studies, Museum Practicum, and Gallery Practicum.

Students must pass a comprehensive art history examination at the beginning of the second year for admission to candidacy. Failure to pass the examination will result in adjustments to the student's program or, if warranted, dismissal from the program. Reading proficiency in a foreign language appropriate to the major area of study must be demonstrated before thesis research is begun. Language courses are not applicable toward degree credit.

Art history students may also participate in courses offered by the State University System's programs in London and Florence.

ARE 5315—Teaching Art in Elementary School I (3)
ARE 6049—History of Teaching Art (3) History of the theory and practice of teaching art.
ARE 6141—Aesthetic Experience (3) Studies in vision, motion, sound, and synaesthesia designed to build greater awareness of immediate experience. Relationship between aesthetic and artistic creation.
ARE 6148—Curriculum in Teaching Art (3) Contemporary theories for development of art teaching curricula.
ARE 6648—Philosophy and Psychology of Teaching Art (3) Philosophical and psychological theories on nature of art, artistic creation, and art teaching. Relationship between artist and audience.
ARE 6705—Methods of Research in Art Education (3) Study of qualitative and quantitative research methods. Review of research literature.
ARE 6905—Individual Study (1-5; max: 12)
ARE 6933—Special Topics in Art Education (1-3; max: 6)
ARE 6971—Research for Master's Thesis (1-15) S/U.
ARE 6973—Individual Project (1-10; max: 10) Project in lieu of thesis. S/U.
ARH 5805—Methods of Research and Bibliography (3)
ARH 5905—Individual Study (3-4; max: 12 including ART 5905C)
ARH 6897—Seminar: Practice, Theory, and Criticism of Art (3)
ARH 6910—Supervised Research (1-5; max: 5) S/U.
ARH 6911—Advanced Study (3-4; max: 16) *Prereq: major in art.*
ARH 6914—Independent Study in Ancient Art History (3-4; max: 12) *Prereq: major in art and permission of graduate coordinator.* Egyptian, Near Eastern, Aegean, Greek, Etruscan, Roman.
ARH 6915—Independent Study in Medieval Art History (3-4; max: 12) *Prereq: major in art and permission of graduate coordinator.* Early Christian, Byzantine, Early Medieval, Romanesque, Gothic.
ARH 6916—Independent Study in Renaissance and Baroque Art History (3-4; max: 12) *Prereq: major in art and permission of graduate coordinator.* Renaissance, High Renaissance, Mannerism, Baroque, Eighteenth Century art.
ARH 6917—Independent Study in Modern Art History (3-4; max: 12) *Prereq: major in art and permission of graduate coordinator.* Major art movements of the nineteenth and twentieth centuries.
ARH 6918—Independent Study in Non-Western Art History (3-4; max: 12) *Prereq: major in art and permission of graduate coordinator.* African, Latin American, American Indian, Asian, and Oceanic.
ARH 6938—Seminar in Museum Studies (3) *Prereq: permission of instructor.* History, purposes, functions of museums in general and art museums in particular.
ARH 6946L—Museum Practicum (3) *Prereq: permission of graduate coordinator and prior arrangements with professors.* Work under museum professionals. Readings and periodic discussions with coordinating professor.
ARH 6948L—Gallery Practicum (3) *Prereq: permission of graduate coordinator and prior arrangements with coordinating professor.* Work under supervision of gallery professionals. Readings and periodic discussions with coordinating professor.
ARH 6971—Research for Master's Thesis (1-15) S/U.
ART 5905C—Individual Study (3-4; max: 12 including ARH 5905)
ART 6490—Digital Art Studio (4; max: 12) *Prereq: graduate standing in art or permission of instructor.* Investigation of digital art practices in one or more of the following areas: bit-mapped and object-oriented graphics, 3-D modeling, computer animation, hypermedia and interactivity, and image-processing.
ART 6835C—Research in Methods and Materials of the Artist (3-4; max: 8)
ART 6836—Arts and Public Policy (3) Investigation and analysis of philosophic and economic issues of funding, arts advocacy, art law, health hazards, arts and healing, and shaping of public policy.
ART 6910C—Supervised Research (1-5; max: 5) S/U.
ART 6926C—Advanced Study I (2-4; max: 12) *Prereq: major in art and permission of graduate coordinator.* Application of basic principles of studio art in one of the following areas: ceramics, creative photography, drawing, painting, printmaking, sculpture, graphic design, and multi-media.
ART 6927C—Advanced Study II (2-4; max: 12) *Prereq: major in art and permission of graduate coordinator.* Investigation of selected problems in one of the following areas: ceramics, creative photography, drawing, painting, printmaking, sculpture, graphic design, and multi-media.
ART 6928C—Advanced Study III (2-4; max: 12) *Prereq: major in art and permission of graduate coordinator.* Experimentation in nontraditional approaches to studio art in one of the following areas: ceramics, creative photography, drawing, painting, printmaking, sculpture, graphic design, and multi-media.
ART 6929C—Advanced Study IV (2-4; max: 12) *Prereq: major in art and permission of graduate coordinator.* Stylistic and technical analysis of contemporary studio practices in one of the following areas: ceramics, creative photography, drawing, painting, printmaking, sculpture, graphic design, and multi-media.
ART 6933C—Special Topics (1-4; max: 8) *Prereq: permission of graduate coordinator.* Readings, discussions, and/or studio exploration of various art issues.
ART 6935—Seminar in Arts Administration (3) Administration and management of arts organizations and facilities, the functions of leadership, and the history of the arts services movement.
ART 6940—Supervised Teaching (1-5; max: 5) S/U.
ART 6944—Arts Administration Practicum (1-3; max: 3) *Prereq: permission of arts administration director and prior arrangements with organization or facility.* Part-time field experiences under supervision of arts professional. Reading and periodic discussions with coordinating instructor. S/U.
ART 6947—Professional Internship (1-3; max: 3) *Prereq: permission of arts administration director and prior arrangements with organization or facility and ART 6944.* Training in approved regional or national arts organization, institution, or facility. Instructor and on-site supervision provided. Full-time internship. S/U.
ART 6971—Research for Master's Thesis (1-15) S/U.
ART 6973C—Individual Project (1-10; max: 10) Creative project in lieu of written thesis. S/U.

ASTRONOMY
College of Liberal Arts and Sciences

GRADUATE FACULTY 1993-94

Chairman: S. F. Dermott. *Graduate Coordinator:* H. E. Kandrup. *Graduate Research Professors:* G. Contopoulos; A. E. S. Green. *Distinguished Service Professor:* A. G. Smith. *Professors:* J. R. Buchler; T. D. Carr; K-Y. Chen; S. F. Dermott; S. L. Detweiler; F. E. Dunnam; H. K. Eichhorn; S. T. Gottesman; J. H. Hunter; J. R. Ipser; C. A. Williams;* R.

E. Wilson; F. B. Wood *(Emeritus). Associate Professors:* H. Campins; H. L. Cohen; J. N. Fry; H. E. Kandrup; R. J. Leacock; G. R. Lebo; J. P. Oliver; C. N. Olsson; H. C. Smith. *Associate Scientists:* F. Giovane; B. A. Gustafson.

**This member of the faculty of the University of South Florida is also a member of the graduate faculty of the University of Florida and participates in the doctoral program in the University of Florida Department of Astronomy.*

The Department of Astronomy offers graduate work in astronomy and astrophysics leading to the degrees of Master of Science and Doctor of Philosophy. Current research fields include radio, infrared, and optical astronomy; astrometry and data adjustment theory; cosmology; general relativity; quantum field theory in the early universe; photometry of compact binaries and intrinsic variables; photometry of active galactic nuclei; dynamical astronomy; structure, kinematics, and dynamics of galaxies; solar system dynamics; comets; interplanetary dust; satellite interiors; planetary magnetospheres; lunar occultation observations; radio and optical instrumentation; and certain topics of theoretical stellar astrophysics. The Department is active in Voyager radioastronomical investigations of the magnetospheres of Jupiter, Saturn, Uranus and Neptune.

Research Facilities.—Rosemary Hill Observatory, about 30 miles from Gainesville, houses 76-cm and 46-cm reflectors. Instrumentation includes photographic and CCD cameras, and microprocessor-based photometers. The observatory contains one terminus of a 46-km baseline radio interferometer. The other terminus is at the Dixie County Radio Observatory, 50 miles from campus. The radio observatory has low-frequency (below 40 MHz) instrumentation consisting of a 7-acre filled aperture, phase-steered array, and several smaller antennas, advanced terminal equipment, including wide-band radio spectrographs. Several research programs use national astronomy facilities (KPNO, NRAO, NAIC, CTIO, IRTF, IPAC, and the Kuiper Airborne Observatory).

On campus facilities include a research darkroom containing hypersensitization, sensitometric and photomicrographic equipment, an electronics shop, data reduction rooms with audio and videotape processing equipment, iris photometer, microdensitometer, blink comparator, measuring engines, the Palomar Sky Survey, and a planetary imaging center (under development). The Department also maintains the International Card Catalog of Photometric Binaries. Most scientific books and publications are centrally housed in an extensive science library located near the Department.

Computing within the Department is handled by a distributed client-server environment based on more than 35 RISC-based UNIX workstations (Sun, DEC, IBM). This environment provides each user with the desktop computing power necessary to run sophisticated applications ranging from document preparation (The Publisher, TEX) to data analysis and image processing (AIPS, IRAF, PVWAVE). In addition to the Department's facilities , researchers also have access (via Internet) to an IBM ES/9000 mainframe vector facility operated and maintained by the Northeast Regional Data Center (NERDC) and located in the same building as the Astronomy Department. BITNET, Internet, and SPAN network connections are also available. The University is a Smartnode of the Cornell National Computer Facility and has a direct link to the Florida State Supercomputer in Tallahassee.

For direct admission to the program, a student should have a degree in astronomy, physics, or mathematics from an accredited program. Students with degrees in related fields, such as engineering, may be admitted with the understanding that certain foundation courses will have to be taken. If it seems desirable, an individual with a strong background in physics may perform the graduate research work in astronomy but take the qualifying examination and degree in physics rather than astronomy. All degree candidates are required as part of their training to assist in the Department's teaching program. Complete details of the program and research facilities may be obtained by writing the Graduate Coordinator, 211 Bryant Space Sciences Building.

AST 5045—History of Astronomy (2) *Prereq: AST 1002 or 3019C.* General survey of the history of astronomy from the earliest times down to the present day.

AST 5113—Solar System Astrophysics I (3) *Prereq: two years of college physics.* Survey of the solar system, including its origin and laws of planetary motion. The earth as a planet: geophysics, aeronomy, geomagnetism, and the radiation belts. Solar physics and the influence of the sun on the earth.

AST 5114—Solar System Astrophysics II (3) *Prereq: AST 5113.* The moon and planets; exploration by ground-based and spacecraft techniques. The lesser bodies of the solar system, including satellites, asteroids, meteoroids, comets; the interplanetary medium.

AST 5144—Asteroids, Comets, and Meteorites (3) *Prereq: AST 5114.* Introduction to physical, chemical, and mineralogical characteristics of these major solar system objects, and their relevance to origin and evolution of our planetary system.

AST 5205—Stellar Spectra (2) *Prereq: AST 3019C.* Review of stellar spectroscopy and an introduction to the classification of stellar spectra at low dispersion.

AST 5210—Introduction to Astrophysics (3) *Prereq: AST 3019C.* Particular emphasis upon the fundamentals of radiative transfer and detailed development of Planck's expression for the specific intensity of blackbody radiation. The basic equations of stellar structure are derived, and particular solutions of these equations are considered along with their astronomical implications.

AST 5270—Introduction to Binary Stars (3) *Prereq: AST 3019C.* Suitable for the nonspecialist who needs some familiarity with the field and for the student who requires a basic foundation for further, more specialized study of binary stars. Includes an introduction to the fundamental data, philosophy of orbital element analysis, morphology and classification, mass exchange and other dynamical effects. Concludes with the structure and evolution of binary stars.

AST 5273—Interacting Binary Stars (2) *Prereq: AST 3019C.* Description of the various aspects of interacting binary stars designed chiefly for students who plan to complete their dissertations in other branches of astronomy. Also suitable for undergraduate majors in the department.

AST 6155—Planetary Interiors (3) Methods for determination of internal structures of planets and satellites with emphasis on interpretation of their external gravitational fields and shapes.

AST 6214—Stellar Astrophysics I: Atmosphere (3) *Prereq: AST 5210 or equivalent.* Theoretical approach to the study of stellar atmospheres.

AST 6215—Stellar Astrophysics II: Interior (3) *Prereq: AST 6214.* Theoretical approach to the study of stellar structure.

AST 6216—Stellar Astrophysics III: Evolution (2) *Prereq: AST 6215.* Theoretical approach to the study of stellar evolution.

AST 6274—Analysis of Binary Star Observations (4) *Prereq: AST 5270.* Analytical study and theoretical interpretation of observational data for eclipsing, spectroscopic, and visual binary systems.

AST 6305—Space Plasma Physics (2) *Prereq: introductory electromagnetic theory.* Derivation and application of electrodynamic relationships in magnetospheric, interplanetary, interstellar, and other astrophysical plasmas. Excitation and propagation of hydromagnetic and electromagnetic waves in such regions.

AST 6309—Galactic and Extragalactic Astronomy (4) *Prereq: AST 3019C.* Observations and interpretations of the kinematics, dynamics, and structure of the Milky Way Galaxy, extragalactic objects, and galaxy clusters.

AST 6336—Interstellar Matter (3) *Prereq: AST 5210.* Complex interplay of physical processes that determine the structure of the interstellar medium in our galaxy; emphasis is placed upon a comparison of observational data with theoretical prediction.

AST 6416—Cosmology (3) *Prereq: PHZ 6606.* Introduction to the observational background and to the theory of cosmology.

AST 6506—Celestial Mechanics (3) *Prereq: AST 3019C.* Dynamics of solar system, emphasis on role of dissipative forces and resonant gravitational forces in determining structure of system.
AST 6600—Computational Astronomy (4) *Prereq: MAS 4106.* Designed to familiarize the student with the statistical tools of astonomical data reduction and the empirical establishment of the positional and kinematical parameters of the bodies in the universe, and the physical and geometric significance of these parameters. The laboratory consists of the numerical (and theoretical) solution of relevant problems.
AST 6601C—Focal-Plane Astrometry (2) *Prereq: AST 6600.* Estimation of astrometric data (relative positions, proper motion components) of celestial objects (stars) from focal-plane images (photographs, CCD).
AST 6705C—Techniques of Optical Astronomy I (2) *Prereq: AST 3019.* Fundamental principles of optical imaging in astronomical instruments. Principles of photographic and photoelectric instruments. Principles of photographic and photoelectric detectors. Laboratory exercises.
AST 6706C—Techniques of Optical Astronomy II (2) *Prereq: AST 6705C.* Design of instrumentation for optical astronomy; telescopes, photometers, spectrographs. Observational techniques and data reduction. Laboratory exercises.
AST 6711—Basic Principles of Radio Astronomy (3) *Prereq: AST 3019; coreq: PHY 4324.* Introduction to radio astronomy, including early history, measurement parameters, applicable radio physics, relevant mathematical techniques, properties of band-limited gaussian noise, and limitations on radio telescope sensitivity and resolution.
AST 6712—Radio Astrophysics (2) *Prereq: AST 6711.* Astrophysical plasmas, radio source emission mechanisms and spectra, principal types of results obtained in radio astronomy and their astrophysical implications.
AST 6715—Radio Astronomy Instrumentation (2) *Prereq: AST 6711.* Survey of radio astronomy instrumentation, including basic principles and methods of operations. Study of antennas and arrays, interferometers, polarimeters, receivers, recorders, and calibration devices.
AST 6715L—Radio Astronomy Laboratory (1) *Coreq: AST 6715.* Laboratory experiments and observatory sessions designed to accompany AST 6715.
AST 6905—Individual Work (1-3; max: 6) Supervised study or research in areas not covered by other courses.
AST 6910—Supervised Research (1-5; max: 5) S/U.
AST 6935—Seminar in Modern Astronomy (1; max: 6) Recent developments in theoretical and observational astronomy and astrophysics. S/U.
AST 6940—Supervised Teaching (1-5; max: 5) S/U.
AST 6943—Internship in College Teaching (2,4,6; max: 6) Required for Master of Science in Teaching candidates but available for students needing additional practice and direction in college-level teaching.
AST 6971—Research for Master's Thesis (1-15) S/U.
AST 7939—Special Topics (2-4; max: 12) Assigned reading, programs, seminar, or lecture series in a new field of advanced astronomy.
AST 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.
AST 7980—Research for Doctoral Dissertation (1-15) S/U.
PHZ 6606—Special and General Relativity (4) *Prereq: PHY 6246, tensor analysis, invariance.* Einstein's special and general theories of relativity; relativistic cosmology.

BIOCHEMISTRY AND MOLECULAR BIOLOGY
College of Medicine

GRADUATE FACULTY 1993-94

Chairman: D. L. Purich. *Graduate Coordinator:* R. P. Boyce. *Professors:* C. M. Allen, Jr.; R. P. Boyce; P. W. Chun; B. M. Dunn; M. S. Kilberg; P. J. Laipis; T. W. O'Brien; D. L. Purich; S. Schuster; M. Young. *Associate Professors:* R. J. Cohen; S. C. Frost; T. H. Mareci; H. S. Nick. *Assistant Professors:* B. D. Cain; P. M. McGuire; T. Yang. *Assistant Scientists:* N. D. Denslow; M. J. Koroly.

The Department of Biochemistry and Molecular Biology offers the Master of Science and Doctor of Philosophy degrees in biochemistry with specialization in physical biochemistry, molecular biology, cell biology, and medical biochemistry.

Specific areas of study include structure and function of cellular and nuclear membranes in mammalian cells; transport of molecules into the cell; regulation of cell division and gene expression; X-chromosome inactivation; assembly and regulation of the cytoskeleton; biochemistry of differentiation; biochemical genetics; molecular biology of nucleic acids; site-directed mutagenesis; replication and repair in bacterial and eukaryotic cells; biosynthesis and structure of nucleic acids, proteins, polysaccharides, lipids, lipoproteins, sensory biochemistry; isoprenoid metabolism; physical biochemistry of nucleic acids and proteins; mechanism of enzyme action; molecular evolution; and allied areas of structural biology.

New graduate students should have adequate training in general, organic, quantitative, and physical chemistry as well as in physics, biology, and calculus. Minor deficiences may be made up immediately after entering graduate school.

Doctoral candidates are required to take several biochemistry courses which include BCH 6156C, 6206, 6415, 6740, 6876, and 6936. Depending upon interests and background of the student, additional courses are recommended from the following list: BCH 6296, 6746, 7410, and 7515. The curriculum for doctoral candidates may also include advanced chemistry, physiology, microbiology, and genetics courses.

BCH 6156C—Research Methods in Biochemistry (1-4; max: 8) *Coreq: BCH 6415, 6740. Only by special arrangement.* Biochemical research in which the student refines research techniques in physical biochemistry, intermediary metabolism, molecular biology, and cell biology under supervision of a staff member.
BCH 6206—Advanced Metabolism (3) *Prereq: general biochemistry or consent of instructor.* The reactions of intermediary metabolism with emphasis upon their integrations, mechanisms, and control. One of the three core biochemistry courses.
BCH 6296—Advanced Topics in Metabolic Control (1; max: 6) *Prereq: BCH 6206, 6415, 6740, or consent of instructor.* Study of the thermodynamic, allosteric, hormonal, and genetic control of metabolic reactions.
BCH 6415—Advanced Molecular and Cell Biology (3) *Prereq: general biochemistry or consent of instructor.* An advanced course in the molecular biology of pro- and eukaryotes. Topics will include DNA replication, chromosome organization, RNA and protein synthesis, and molecular aspects of gene regulation. One of the three core biochemistry courses.
BCH 6740—Advanced Physical Biochemistry (3) *Prereq: general biochemistry and physical chemistry or consent of instructor.* Physical chemistry of biological molecules and the techniques for their study. Constitutes one of the three core biochemistry courses.
BCH 6746—Advanced Topics in Physical Biochemistry (1; max: 6) *Prereq: BCH 6206, 6415, 6740, or consent of instructor.* Study of physical chemistry of proteins, nucleic acids, lipids, enzymes, as well as their modes of interaction.
BCH 6876—Recent Advances in Biochemistry (1) *Prereq: BCH 6740 or equivalent.* Areas of biochemistry and molecular biology, selected by the faculty, discussed critically and in depth. Emphasis on current controversy and theory, data interpretations, and scientific writing. Classes held informally in small groups, during each semester, involving all biochemistry faculty on a rotating basis. S/U.
BCH 6910—Supervised Research (1-5; max: 5) S/U.
BCH 6936—Biochemistry Seminar (1; max: 20) *Required of graduate students in biochemistry; open to others by special arrangement.* Research reports and discussions of current re-

search literature given by the departmental staff, invited speakers, and graduate students.
BCH 6940—Supervised Teaching (1-5; max: 5) S/U.
BCH 6971—Research for Master's Thesis (1-15) S/U.
BCH 7410—Advanced Topics in Molecular Biology (1; max: 6) *Prereq: BCH 6206, 6415, 6740, or consent of instructor.* The biochemical basis of molecular biology and genetics with emphasis on the mode of control surrounding the replication and expression of the pro- and eukaryotic genome.
BCH 7515—Enzyme Kinetics and Mechanisms (2) *Prereq: advanced general course in biochemistry such as BCH 6740, 6206, or consent of instructor.* The study of enzyme reaction mechanisms using kinetics, spectroscopy, protein crystallography, and new emerging techniques. Alternates with BMS 6203, spring semester.
BCH 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.
BCH 7980—Research for Doctoral Dissertation (1-15) S/U.
BMS 6203—Cell Membranes: Molecular Biology and Function (2) *Prereq: BCH 4024 and MCB 3020 or equivalents and consent of instructor.* Composition, molecular organization, and assembly of biological membranes in both eukaryotes and prokaryotes. Alternates with BCH 7515, spring semester.
GMS 5621—Cell and Tissue Biology (4) *Prereq: cell biology course and consent of instructor.* Cell specializations and interactions that account for the organization and functions of the basic tissues (epithelium, connective tissue, muscle, and nerve).

BOTANY
College of Liberal Arts and Sciences and Agriculture

GRADUATE FACULTY 1993-94

Chairman: D. A. Jones. *Graduate Coordinator:* J. T. Mullins. *Graduate Research Professors:* D. Dilcher; I. K. Vasil. *Professors:* H. C. Aldrich; G. E. Bowes; J. S. Davis; J. J. Ewel; D. G. Griffin, III; W. S. Judd; J. T. Mullins; F. E. Putz; R. C. Smith; W. L. Stern; D. B. Ward; N. H. Williams. *Associate Professor:* T. W. Lucansky. *Assistant Professors:* D. R. Gordon; A. C. Harmon; S. R. Manchester; K. Williams.

The Department of Botany offers graduate work leading to the degrees of Master of Science, Master of Agriculture, Master of Science in Teaching, and Doctor of Philosophy.

The faculty encompass three general areas of expertise: biochemistry and physiology, ecology and population genetics, systematics and evolution. Specific areas of specialization include anatomy/ morphology with emphasis on tropical ferns, aquatic and woody plants, and orchids; bryology; ecology and environmental studies; ecological, cellular, and molecular genetics; mycology with emphasis on physiology and development; algology with emphasis on algae of brine ponds; physiology and biochemistry with emphasis on ion uptake, photosynthesis and photorespiration, growth and development of selected fungi, calcium-binding proteins and protein phosphorylation; systematics with emphasis on monographic and floristic studies; paleobotany; physiological ecology; tropical botany and ecology.

For admission to graduate studies a student should present acceptable scores on the verbal, quantitative, and analytical sections of the GRE General Test. Full graduate standing also requires credits equivalent to those required for undergraduate majors in the Department, namely 24 credits in botany, a course in genetics with laboratory, mathematics through differential calculus, one year of college physics, and chemistry through organic. Those admitted without full equivalents of an undergraduate major will be required to make up the deficiencies by passing appropriate courses early in their graduate programs. A reading knowledge of a foreign language and credit for basic courses in zoology and microbiology are desirable. The program of graduate study for each student will be determined by a supervisory committee. No more than nine credits of BOT 6905 may be used to satisfy the credit requirements for a master's degree. Each new student will be required to enroll in Advances in Botany taught by the faculty during the fall semester of the first year.

There are, in addition to the facilities of the Department for graduate work, the following special resources that may be utilized in support of graduate student training and research: (1) the Florida Agricultural Experiment Stations, (2) the Marine Sciences Center on the Gulf of Mexico for studies in estuarine and marine habitats, (3) the resources of the Welaka Conservation Reserve, (4) the Center for Tropical Agriculture, which can support studies in tropical and subtropical areas, (5) the Center for Latin American Studies, (6) the Center for Aquatic Plants, (7) the Interdisciplinary Center for Biotechnology Research, (8) the Fairchild Tropical Garden for research in the systematics, morphology and anatomy, and economic botany of tropical plants, and (9) the Marie Selby Botanical Gardens, Sarasota.

BOT 5115—Paleobotany (3) *Prereq: upper-level course in botany or geology or permission of instructor.* Comparative study of plants through geologic time with attention to morphology and evolution of major groups of land plants based on fossil record. Offered spring semester in odd-numbered years.
BOT 5225C—Plant Anatomy (4) *Prereq: BOT 2011C or 3303C or consent of instructor.* Origin, structure, and function of principal cells, tissues, and vegetative and reproductive organs of seed plants. Offered fall semester.
BOT 5405C—Algology (4) *Prereq: BOT 2011C or 3303C or consent of instructor.* Algae, especially their structure, reproduction, growth, classification, and evolution. Emphasis on Florida marine and fresh water species. Offered fall semester in odd-numbered years.
BOT 5485C—Mosses and Liverworts (3) *Prereq: BOT 2011C or 3303C.* Morphology of the major groups of bryophytes, with emphasis on collection, identification, and ecology of these plants in Florida. Offered fall semester in odd-numbered years.
BOT 5505C—Intermediate Plant Physiology (3) *Prereq: BOT 3503, 3503L, and CHM 3200, 3200L, or equivalent.* Fundamental physical and chemical processes underlying the water relations, nutrition, metabolism, growth, and reproduction of higher plants. Offered fall semester.
BOT 5625—Plant Geography (2) *Prereq: BOT 3153 or 5725C.* Geography of the floras and types of vegetation throughout the world, with emphasis on problems in the distribution of taxa, and the main factors influencing types of vegetation. Offered fall semester in even-numbered years.
BOT 5646C—Ecology and Physiology of Aquatic Plants (3) *Prereq: PCB 3043.* Ecological and physiological principles in freshwater habitats and plant communities with laboratory and field studies. Offered spring semester in even-numbered years.
BOT 5685—Tropical Botany (7) *Prereq: elementary biology/ botany; beginning course in plant systematics; anatomy and morphology; consent of instructor.* Study of tropical plants utilizing the diverse habitats of South Florida with emphasis on uses, anatomy and morphology, physiology and ecology, and systematics of these plants. Field trips and the Fairchild Tropical Garden supplement laboratory experiences. Offered summer semester.
BOT 5695—Ecosystems of Florida (3) *Prereq: PCB 3043 or equivalent and consent of instructor.* Major ecosystems of Florida in relation to environmental factors and man's relationship to them. Emphasis of Saturday field trips is on field techniques and research approaches. Offered spring semester in even-numbered years.
BOT 5725C—Taxonomy of Vascular Plants (4) *Prereq: BOT 2011C and 3303C or equivalent.* Introduction to systematic principles and techniques used in classification; field and herbarium methods. Survey of vascular plants, their classification, morphology, and evolutionary relationships. Offered spring semester in even-numbered years.

BOT 6256C—Plant Cytology (3) *Prereq: MCB 4403 or equivalent.* Fundamental structures of plant cells, their functions, reproduction, and relation to inheritance; recent research and techniques. Offered fall semester in even-numbered years.
BOT 6496C—Fungal Physiology (3) Comparative physiology of growth, development, metabolism, and reproduction of selected fungi. Offered on demand.
BOT 6516—Plant Metabolism (3) *Prereq: BOT 5505C, BCH 4024.* Metabolism of carbohydrates, fats, and nitrogen compounds in higher plants; cell structures as related to metabolism; metabolic control mechanisms. Offered spring semester in odd-numbered years.
BOT 6526—Plant Nutrition (2) *Prereq: BOT 5505C.* Plant nutrition including essentiality of elements, absorption of ions, utilization of minerals in plants, and water metabolism. Offered summer term A.
BOT 6566—Plant Growth and Development (3) *Prereq: BOT 5505C.* Fundamental concepts of plant growth and development with emphasis on the molecular biological approach. Offered spring semester.
BOT 6576—Photophysiology of Plant Growth (3) *Prereq: BOT 5505C.* Effects of light on the physiology and biochemistry of plants. Photosynthesis and photorespiration emphasized. Properties of light sources, photochemistry, phytochrome action, photomorphogenesis, photoperiodism, and phototropism examined. Offered spring semester.
BOT 6716C—Advanced Taxonomy (2) *Prereq: BOT 5725C or equivalent.* Survey of vascular plant families of limited distribution and/or of phylogenetic significance not covered in BOT 5725C with discussions of their classification, morphology, and evolutionary relationships. Published studies reviewed to demonstrate principles and methods involved in classification. Offered on demand.
BOT 6905—Individual Studies in Botany (1-9; max: 9) *Prereq: all credits in excess of 3 must be approved by department chairman or graduate coordinator.* Individual nonthesis, research problem in one of the following areas of botany: ecology, physiology and biochemistry, cryptogamic botany, morphology and anatomy of vascular plants, systematics, cytology, genetics, and ultrastructure. Topics selected to meet the interests and needs of students.
BOT 6910—Supervised Research (1-5; max: 5) S/U.
BOT 6927—Advances in Botany (1-3; max: 9) Supervised study in specific areas.
BOT 6936—Graduate Student Seminar (1; max: 9) Readings and oral presentation on general topics in botany. S/U.
BOT 6940—Supervised Teaching (1-5; max: 5) S/U.
BOT 6943—Internship in College Teaching (2, 4, 6; max: 6) Required for Master of Science in Teaching candidates but available for students needing additional practice and direction in college-level teaching.
BOT 6951—Tropical Biology: An Ecological Approach (8) Intensive field study of ecological concepts in tropical environments. Eight weeks in different principal kinds of tropical environments. Offered summer term in Costa Rica as part of the program of the Organization for Tropical Studies.
BOT 6971—Research for Master's Thesis (1-15) S/U.
BOT 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.
BOT 7980—Research for Doctoral Dissertation (1-15) S/U.
HOS 6116C—Developmental Morphology of Flowering Plants (3) *Prereq: BOT 3303C.* Developmental morphology of the vegetative and reproductive organs of flowering plants with particular emphasis on form and function as revealed by recent experimental techniques. Offered spring semester in even-numbered years.
HOS 6231—Biochemical Genetics of Higher Plants (3) *Prereq: AGR 3303 or PCB 3063 and BCH 4313 or equivalent.* Discussion of current evidence bearing on gene function and regulation, examples of the use of plant mutants in the elucidation of biochemical pathways, and examination of somatic cell genetics in higher plants. Offered fall semester.
HOS 6373C—Methods and Applications of Plant Cell and Tissue Culture (3) *Prereq: HOS 6116C.* Laboratory techniques for the culture of plant protoplasts, cells, tissues, and organs, and their applications in the study of cellular differentiation, development, genetics, and agriculture. Offered spring semester in even-numbered years.
PCB 5046C—Advanced Ecology (4) *Prereq: PCB 3043C or equivalent and one course in statistics; physics, chemistry, and physiology desirable.* Plant ecology and plant-animal interactions with emphasis on design of field studies and data analysis. Students conduct a series of one-day research projects in various ecosystems and present results orally and as short research papers. Offered fall semester in odd-numbered years.
PCB 5575C—Ecological Genetics (3) *Prereq: upper-level course in genetics, evolution, or population biology.* Genetic nature, distribution, and analysis of variation in natural populations of animals and plants. Role of modern techniques in resolving problems in genetic structure of populations. Offered spring semester.
PCB 6176—Electron Microscopy of Biological Materials (2) *Prereq: PCB 5115C or 3136 or equivalent.* Use of electron microscopes, including fixation, embedding, sectioning, freeze-etching, negative staining, and use of the vacuum evaporator. Offered spring semester.
PCB 6176L—Laboratory in Electron Microscopy (2) *Coreq: PCB 6176 and consent of instructor.* Laboratory training in use of electron microscopes, ultramicrotomes, vacuum evaporators, and freeze-etch machines. Offered spring semester.
PCB 6216C—Cytochemistry (3) *Prereq: PCB 6176L or consent of instructor.* Cellular organization, cell function, and cytochemical technique. Offered fall semester in even-numbered years.
PCB 6356C—Ecosystems of the Tropics (3) *Prereq: PCB 3043C.* Natural and man-dominated tropical ecosystems, their structure, function, and relation to man. Offered spring semester.
PCB 6605C—Principles of Systematic Biology (4) Theory of biological classification and taxonomic practice. Laboratory experience in taxonomic procedures and techniques, including computer methods. Offered spring semester in odd-numbered years.
PCB 6691—Topics in Plant Genetics (2; max: 6) Offered fall semester in odd-numbered years.
PLP 6657C—Biology and Taxonomy of Aquatic and Lower Fungi (3) *Prereq: PLP 5656C or equivalent.* Structure, development, and taxonomy of zoosporic and zygosporic fungi. Offered summer A in odd-numbered years.
PLP 6658C—Biology and Taxonomy of the Basidiomycetes (3) *Prereq: PLP 5656C or equivalent.* Isolation, collection, and identification of field material required. Offered summer B in odd-numbered years.
PLP 6659C—Biology and Taxonomy of Ascomycetes and Their Anamorphic States (3) *Prereq: PLP 5656C or equivalent.* Collection, isolation, and identification. Offered summer C in even-numbered years.

M. E. RINKER SCHOOL OF BUILDING CONSTRUCTION
College of Architecture

GRADUATE FACULTY 1993-94

Director: W. P. Chang. *Graduate Coordinator:* P. Oppenheim. *Professors:* B. H. Brown, Jr.; W. P. Chang; R. E. Cox; R. E. Crosland; B. G. Eppes; H. F. Holland; J. M. Trimmer. *Associate Professors:* R. B. Issa; R. B. Johnson; C. Kibert; F. Liou; J. W. Martin; P. Oppenheim; K. Tenah. *Assistant Professors:* R. Coble; R. A. Furman; L. Kone; A. Shanker; D. L. Waller; L. E. Wetherington. *Lecturer:* W. Edwards.

In addition to the Doctor of Philosophy degree administered at the College of Architecture level emphasizing construction management, courses are offered leading to the degrees of Master of Science in Building Construction (thesis) and Master of Building Construction (nonthesis). An individual plan of study is prepared for each student to insure that the student's goals are achieved within the broad policy guidelines of the school. Specialization may be in areas such as the construction manager concept, planning and scheduling, cost control, high rise construction, materials, techniques, and structural concepts.

There is no foreign language requirement.

To be eligible for admission, a student must hold a four-year undergraduate degree in building construction or its equivalent in related fields. "Equivalent in related fields" should include studies in construction materials and methods, structures, and management. Students with deficiencies in these related fields may need longer residence for the master's degree, as they will be required to take specified basic courses to provide a foundation for advanced courses.

No more than three credits of BCN 6934 or 6971 may be used to satisfy the credit requirements for a master's degree without written permission of the Director. Candidates are required to take BCN 5463, 5625, and 5715.

The School reserves the right to retain student work for purposes of record, exhibition, or instruction.

Research Facilities.—The Building Construction Industry Advisory Committee (BCIAC), an outside committee under the Florida Department of Education, annually funds the School specifically for research and continuing education in the construction field. The Center for Affordable Housing, operating within the School, researches the problems and possible solutions associated with the development and production of affordable housing. The Fire Testing and Research Center, cosponsored by the Florida Division of State Fire Marshals, conducts standard fire tests and fire protection research projects. The Center for Real Estate Development, a cooperative effort with the College of Business Administration, researches topics concerning the ever-growing environment of real estate development in Florida. The Center for Construction and Environment and the Center for Safety and Loss Control have been established in the School.

ARC 6644—Modeling Techniques in Architectural Acoustics (3) Theory and practice of ultrasonic, computer, and other techniques used to model human subjective response to sound and their application in the design of buildings.
ARC 7790—Doctoral Core I (3) Philosophy, theory, and history of inquiry into the processes of design, urban development, and building systems.
ARC 7792—Doctoral Core II (3) *Prereq: ARC 7790.* Urban, environmental, and legal systems in the context of urban development.
ARC 7794—Doctoral Seminar (1; max: 4) Current planning, architecture, development, and construction theories.
ARC 7911—Advanced Architectural Research I (3) *Prereq: STA 6167.* Architectural, planning, and construction research design with relevant mathematical and computer methods.
ARC 7912—Advanced Architectural Research II (3) *Prereq: ARC 7911.* Conduct of research in architecture, planning, and construction.
ARC 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U
ARC 7980—Research for Doctoral Dissertation (1-15) S/U.
BCN 5463—Advanced Construction Structures (4) *Prereq: BCN 3461.* Study of soils, dewatering and the temporary structures that contractors have to build in order to build the primary structure.
BCN 5463L—Laboratory in Advanced Construction Structures (1) Laboratory training in the testing of construction materials.
BCN 5470—Construction Methods Improvements (3) Methods of analyzing and evaluating construction techniques to improve project time and cost control. Work sampling, productivity ratings, crew balance studies, time lapse photography, and time management.
BCN 5618—Advanced Estimating (4) *Prereq: graduate standing / BCN 4612.* Estimating process in building construction through use of computers and conceptual estimating.
BCN 5625—Construction Cost Analysis (3) *Prereq: BCN 4612.* Study of cost engineering and cost distribution and comparative analysis of actual and estimated cost as used for project control.
BCN 5715—Advanced Construction Labor Problems (3) *Prereq: graduate status.* Labor problems in the construction industry and associated legislation. How to work effectively with unionized labor on construction projects.
BCN 5722—Advanced Construction Planning and Control (3) *Prereq: COP 3210, BCN 4612.* Time-cost relationships for various construction operations.
BCN 5776—International Construction Business Management (3) *Prereq: BCN 4700.* Construction contracting, emphasis on international economics, marketing, contracts, design, and specifications.
BCN 5905—Special Studies in Construction (1-5;max:12) *Prereq: graduate status or special permission of the instructor.* For students requiring supplemental work in the building construction area.
BCN 6228—High-Rise Construction (3)
BCN 6585—Environmental Impacts of Construction (3) *Prereq: graduate standing.* Environmental issues that affect construction operations as well as how construction operations affect environment.
BCN 6621—Bidding Strategy (3) Strategy of contracting to maximize profit through overhead distribution, breakeven analysis, probability and statistical technique, a realistic risk and uncertainty objective, and bid analysis both in theory and in practice.
BCN 6641—Construction Value Engineering (3) Principles and applications for construction industry.
BCN 6748—Construction Law (3) Formation of a company, licensing, bid process, contracts, plans and specifications, mechanics liens, insurance bonds, and remedies as they relate to the building constructor and construction manager. Case studies.
BCN 6905—Directed Independent Study in Construction (1-3; max: 3) *Prereq: graduate standing.*
BCN 6910—Supervised Research (1-3; max: 3) S/U.
BCN 6931—Construction Management (1-5;max: 13) Construction management or specialized areas of the construction field.
BCN 6932—Building Construction Management (1-5; max: 12) Building technology and management or specialized areas of the building construction field.
BCN 6933—Advanced Construction Management (1-5; max: 12) Financial and technological changes affecting construction and the management of construction projects. H.
BCN 6934—Construction Research (1-6; max: 12) Independent studies. H.
BCN 6940—Supervised Teaching (1-3; max: 3) S/U.
BCN 6971—Research for Master's Thesis (1-15) S/U.

BUSINESS ADMINISTRATION—GENERAL
College of Business Administration

Graduate programs offered by the College of Business Administration are the Doctor of Philosophy in economics; the Doctor of Philosophy in business administration; the Master of Arts in economics; the Master of Arts in business administration with tracks in decision and information sciences, finance, insurance, management, marketing, and real estate and urban analysis; the Master of Business Administration (MBA); and the Master of Science in computer and information sciences. The Master of Accounting degree (M.Acc.) is offered through the Fisher School of Accounting. Fields of concentration and requirements for the MBA are given under *Requirements for Master's Degrees* in the front section of the *Catalog*. Requirements for the Ph.D. and M.A. degrees may be found under the description for the respective department.

The Ph.D. in business administration requires a principal or major field in one of the following: accounting, decision and information sciences, finance, insurance, management, marketing, or real estate and urban analysis. Specific requirements for the various departments and specialties within the departments are stated in the department descriptions in this *Catalog*. All candidates for the Ph.D. in business administration must satisfy the following general requirements:

Breadth Requirement.—All applicants for the Ph.D. in business administration program are expected to have completed prior business-related course work at either the advanced undergraduate or graduate level. Students enter-

ing without prior work are required to take a minimum of three graduate courses in at least two fields other than their chosen area of concentration. Most often, the appropriate courses will be found in the MBA first-year core; the particular courses to be taken by a student will be decided in consultation with the student's academic adviser. After a student enters the Ph.D. program, the courses taken to satisfy the breadth requirement must be taken in the College of Business Administration.

Research Foundations Requirement.—All students must complete a six-course research skills sequence that prepares them for scholarly research in their chosen area of concentration. Research foundations are defined as essential methodological tools (e.g., statistics, quantitative analysis) and/or substantive content domains (e.g., psychology, economics) outside the student's major field that are considered essential to conducting high quality research in the chosen field. The specific research skills required by each area of concentration can be found in the field descriptions in this *Catalog*.

Other requirements for the Ph.D. degree include satisfactory completion of graduate course work in the major field of concentration, as well as one or two supporting fields designed to add depth to the student's research training. The areas of depth are selected by the student in consultation with his or her advisory committee, and may be within or outside the College of Business Administration. Other requirements for the Ph.D. are given in the *General Information* section of this *Catalog*.

GEB 5215—Problem Analysis and Presentation in Business I (1) *Designed for MBA candidates.* Designed to improve written and oral communications in a business environment. H.
GEB 5216—Problem Analysis and Presentation in Business II (1) *Prereq: GEB 5215. Designed for MBA candidates.* Designed to improve written and oral communications in a business environment.
GEB 5405—Legal Environment of Business (3) *Designed for MBA candidates.* The American legal system; sources of law; adjudication; the legal nature of the corporation; major areas of state and federal corporate law; state and federal regulation of business; legal aspects of ethical and social responsibility.
GEB 5795—International Business (3) *Designed for MBA students.* Exploration of major characteristics, motivations, interactions, and structural realities of international economics via functional areas of business. Development of multinational framework for effective and efficient firm operation.
GEB 6905—Individual Work (1-4; max: 8) *Prereq: consent of Associate Dean or MBA Director.* Reading and/or research in business administration.
GEB 6957—International Studies in Business (1-4; max: 12) *Prereq: admission to approved study abroad program and permission of department.* S/U.

CHEMICAL ENGINEERING
College of Engineering

GRADUATE FACULTY 1993-94

Chairman: T. J. Anderson. *Graduate Coordinator:* M. E. Orazem. *Professors:* T. J. Anderson; S. S. Block (*Emeritus*); R. W. Fahien (*Emeritus*); A. L. Fricke; G. B. Huflund; L. E. Johns, Jr.; H. H. Lee; F. P. May (*Emeritus*); R. Narayanan; M. E. Orazem; D. O. Shah; S. A. Svoronos; R. D. Walker, Jr. (*Emeritus*). *Associate Professors:* D. W. Kirmse; C. W. Park; G. B. Westermann-Clark. *Assistant Professors:* I. Bitsanis; O. D. Crisalle; R. B. Dickinson.

Graduate work for the Ph.D., M.E., and M.S. degrees in chemical engineering emphasizes these areas: (1) chemical engineering science—transport phenomena, fluid dynamics, thermodynamics, kinetics, statistical mechanics, microstructure of matter, and materials science; (2) chemical engineering systems—chemical reaction engineering, process control, process dynamics, optimization, separation processes; and (3) interdisciplinary chemical engineering—energy conversion and fuel cells, corrosion, electrochemical engineering, polymer science, microelectronics, process economics, and bioengineering.

Beyond the Graduate School requirements, admission to graduate work in chemical engineering depends upon the qualifications of the student, whose record and recommendations are carefully and individually studied. During registration week each graduate student registering for the first time is counseled to develop an initial study program. The program of all students will involve research experience through the courses ECH 6905, 6971, or 7980.

CHM 5275—The Organic Chemistry of Polymers (2) Classification of polymerization types and mechanisms from a mechanistic, organic point of view. Structure of synthetic and natural polymers and polyelectrolytes. Reactions of polymers. Practical synthetic methods of polymer preparation.
CHM 5511—The Physics and Physical Chemistry of Polymers (2)
ECH 5708—Disinfection, Sterilization, and Preservation (2) Description of problems and need for these treatments; causative agents and their nature; nature and use of chemical and physical antimicrobial agents; specific problems and solutions.
ECH 5712—Industrial Safety Science and Health Implications (2) Designed for those responsible for the safety and health of people in the workplace, including the consideration of dangers and hazards in industry and measures for eliminating or reducing them.
ECH 5746—Biochemical Engineering Principles (3) Microbial and enzyme processes, with applications to industrial fermentations, enzyme utilization, and wastewater treatment. Application of chemical engineering principles to bioreactors and to bioseparation processes.
ECH 6126—Thermodynamics of Reaction and Phase Equilibria (3) Methods of treating chemical and phase equilibria in multicomponent systems through the application of thermodynamics and molecular theory.
ECH 6146—Applied Statistical Mechanics (2) Methods of wave mechanics and statistical mechanics in engineering problems.
ECH 6206—Turbulent Transport Phenomena (2) *Prereq: ECH 6285.* Statistical theory of turbulence; correlation coefficients, energy spectra, isotropy and homogeneity, eddy diffusivity, and viscosity tensors. Boundary layer theory.
ECH 6207—Rheology (2) Analysis and characterization of rheological systems.
ECH 6208—Non-Newtonian Fluid Dynamics (2) Constitutive equations for non-Newtonian fluids (including viscoelastic substances) such as polymers, plastics, paints, and slurries.
ECH 6226—Heat Transfer Operations (2) Process design of equipment for heat transfer operations based on performance and economic optima.
ECH 6261—Introduction to Transport Phenomena (3) *Prereq: MAC 3202.* Basic equations of change for heat, mass, and momentum. Applications of conservation and flux equations for laminar and turbulent flow. Transfer coefficients, macroscopic balances.
ECH 6285—Transport Phenomena (1-3; max: 3) *Prereq: ECH 6261.* Continuation of ECH 6261.
ECH 6326—Computer Control of Processes (2) Introduction to digital computers, sampled data systems and Z-transforms, control of multiple input-multiple output systems, optimal control, state estimation and filtering, self-tuning regulators.
ECH 6413—Stagewise Separations Processes (2) Theory, design, and evaluation of separation processes such as distillation columns, extractors, and absorbers. Multicomponent-multistage distributions using rigorous digital computer computational methods. Real-time modeling for process automation.
ECH 6506—Chemical Engineering Kinetics (3) Fundamental aspects of chemical reactors, including collision theory, transition rate theory, unimolecular rate theory, homogeneous gas and liquid phase kinetics, and heterogeneous kinetics.
ECH 6526—Reactor Design and Optimization (3) Fundamentals of heterogeneous reactor design including the characterization of catalytic reactions and support, the development of global rate of

the intrinsic reaction affected by chemical and physical deactivation of catalyst, intra- and interphase mass and heat transfer, and the design and optimization of various types of heterogeneous reactors.

ECH 6606—Process Economy Analysis (2) Economics in design and operation of chemical engineering equipment. Analysis for decision under conditions of certainty and uncertainty with applications of queuing, Monte Carlo, Markov Processes, and geometric and dynamic programming.

ECH 6626—Optimization Techniques (2) *Prereq: ECH 4842 or 6845.* Introducton to optimization techniques used in chemical process operations, process control, and systems engineering.

ECH 6646—Process Equipment Design (2) Unit operations, with emphasis on design of equipment to perform the service required, considering capacity, materials, equipment, and economics.

ECH 6647—Process and Plant Design (2) Techniques in the design of various complex chemical processes and plants.

ECH 6709—Electrochemical Engineering Fundamentals and Design (3) Fundamentals of electrodics and ionics applied to systems of interest in electrochemical engineering.

ECH 6726—Interfacial Phenomena I (2) *Prereq: CHM 2043C, PHY 2052.* Air-liquid and liquid-liquid interfaces; surface-active molecules, adsorption at interfaces, foams, micro- and macro-emulsions, retardation of evaporation and damping of waves by films, surface chemistry of biological systems.

ECH 6727—Interfacial Phenomena II (2) *Prereq: CHM 2043C, PHY 2052.* Solid-gas, solid-liquid, solid-solid interfaces. Adsorption of gases and surface-active molecules on metal surfaces, contact angle and spreading of liquids, wetting and dewetting, lubrication, biolubrication, flotation, adhesion, biological applications of surfaces.

ECH 6826—Engineering Properties of Organic Materials (2) Theoretical studies in molecular science. Correlation of composition, microstructure, and morphology of organic materials with macroscopic engineering properties.

ECH 6827—Macromolecular Materials (2) Formation, structure, and physical and chemical properties of macromolecules. Polymerization and processing methods. Commercial techniques in forming. Applications.

ECH 6844—Chemical Engineering Calculations (2) Calculation techniques used in advanced engineering problems.

ECH 6845—Models and Methods (3) *Prereq: ECH 6844.* Mathematical modeling and application to engineering problems of differential equations, operational calculus, computation techniques, complex variables, integral equations, and matrix methods.

ECH 6846—Methods of Multidimensional Systems (3) Green's functions for partial differential equations, regular and singular perturbation methods in transport phenomena. Special topics of related interest. H.

ECH 6847—Applied Field Theory (2) Field equations of heat, mass, and momentum transport, and electromagnetic theory in orthogonal and nonorthogonal Euclidean and non-Euclidean geometries. Covariant and convective differentiation of tensors. Surface geometrics. Applications of Laplace, Helmholtz, diffusion and wave equation.

ECH 6849—Advances in Numerical and Analytical Computation (2) *Prereq: ECH 6845, 6846.* Numerical and analytical techniques such as iterative matrix methods, hybrid computation, direct vector methods, functional analysis, and adaptive models.

ECH 6905—Individual Work (1-6; max: 12) Individual engineering projects suitable for a nonthesis Master of Engineering degree.

ECH 6910—Supervised Research (1-5; max: 5) S/U.

ECH 6926—Graduate Seminar (1; max: 10)

ECH 6936—Advanced Seminar in Chemical Engineering (1-2; max: 8) Research and current literature.

ECH 6937—Topics in Chemical Engineering I (1-4; max: 9) Separations processes, reactor design, applied molecular and kinetic theory, thermodynamics, particulate systems. Properties of chemical substances, transport phenomena, non-Newtonian fluid dynamics, turbulence, applied mathematics, computer science, biochemical and electrochemical engineering.

ECH 6939—Topics in Chemical Engineering III (1-4; max: 9)

ECH 6940—Supervised Teaching (1-5; max: 5) S/U.

ECH 6969—Research Proposal Preparation (1-2; max: 4) H.

ECH 6971—Research for Master's Thesis (1-15) S/U.

ECH 6972—Research for Engineer's Thesis (1-15) S/U.

ECH 7938—Advanced Special Chemical Engineering Topics for Doctoral Candidates (1-4; max: 8)

ECH 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.

ECH 7980—Research for Doctoral Dissertation (1-15) S/U.

CHEMISTRY
College of Liberal Arts and Sciences

GRADUATE FACULTY 1993-94

Chairman: M. C. Zerner. *Graduate Coordinator:* J. A. Deyrup. *Graduate Research Professors:* R. J. Bartlett; M. J. S. Dewar *(Emeritus)*; R. S. Drago; P. O. Lowdin *(Emeritus)*; J. D. Winefordner. *Kenan Professor of Organic Chemistry:* A. R. Katritzky. *Distinguished Service Professors:* W. M. Jones; H. H. Sisler *(Emeritus)*. *Professors:* E. W. Baker;* M. A. Battiste; T. Bieber;* W. S. Brey, Jr.; J. A. Deyrup; W. R. Dolbier, Jr.; J. R. Eyler; R. J. Hanrahan; W. W. Harrison; J. F. Helling; A. Lombardo;* D. A. Micha; M. L. Muga; N. Y. Ohrn; G. J. Palenik; W. B. Person; J. R. Perumareddi;* G. E. Ryschkewitsch *(Emeritus)*; P. A. Snyder;* M. T. Vala, Jr.; K. Wagener; W. Weltner, Jr.; R. A. Yost; M. C. Zerner; J. A. Zoltewicz. *Associate Professors:* J. M. Boncella; A. Brajter-Toth; S. O. Colgate; J. E. Enholm; G. H. Myers; J. R. Reynolds; D. Richardson; G. M. Schmid *(Emeritus)*; K. S. Schanze; D. W. Siegmann;* R. C. Stoufer; V. Young. *Assistant Professors:* R. Duran; R. T. Kennedy; N. G. Richards; D. Talham. *Associate Scientist:* D. H. Powell.

**These members of the faculty of Florida Atlantic University are also members of the graduate faculty of the University of Florida and participate in the doctoral program in the University of Florida Department of Chemistry.*

The Department offers the Master of Science and Doctor of Philosophy degrees with a major in chemistry and specialization in analytical, organic, inorganic, or physical chemistry. The nonthesis degree Master of Science in Teaching is also offered with a major in chemistry.

New graduate students should have adequate undergraduate training in inorganic, analytical, organic, and physical chemistry. Normally this will include as a minimum a year of general chemistry which may include qualitative analysis, one semester of quantitative analysis, one year of organic chemistry, one year of physical chemistry, and one semester of advanced inorganic chemistry. Additional courses in instrumental analysis, advanced physical and organic chemistry are desirable. Deficiencies in any of these areas may be corrected during the first year of graduate study. Such deficiencies are determined by a series of placement tests given prior to registration, and the results of these tests are used in planning the student's program.

Doctoral candidates are required to complete at least 9 semester credits of courses specified by the division of the Chemistry Department in which they choose to specialize, as well as at least 9 semester credits of out-of-major-division courses. There are some minor restrictions on courses that may be used to meet this requirement. Additional courses may be required by the student's supervisory committee or major professor. Foreign students whose native language is not English must achieve a minimum score of 220 on the Test of Spoken English.

Candidates must serve not less than one year as teaching assistants. This requirement will be waived only when, in the opinion of the Department, unusual circumstances justify such action.

A chemical physics option is offered for students who will be doing research in areas of physical chemistry which require a strong background in physics. For this option, a

student meets the departmental requirements for concentration in physical chemistry, except that only one out-of-major division course is required. In addition, a minimum of 14 credits in 4000 level or higher physics courses or a minimum of 7 such credits in physics and 7 in 4000 level or higher mathematics courses is required.

Candidates for the master's degree are required to complete any two core courses. The Master of Science degree in chemistry requires a thesis. The nonthesis degree Master of Science in Teaching is offered with a major in chemistry and requires a written paper of substantial length (30 to 50 pages) on an approved topic pertaining to some phase of chemistry, under the course CHM 6905.

CHM 5224—Basic Principles for Organic Chemistry (3) *Prereq: one year of undergraduate organic chemistry.* A review for those students intending to enroll in the Advanced Organic Sequence CHM 6225, 6226.

CHM 5235—Organic Spectroscopy (3) *Prereq: CHM 3211.* Advanced study of characterization and structure proof of organic compounds by special methods, including IR, UV, NMR, and mass spectrometry.

CHM 5275—The Organic Chemistry of Polymers (2) *Prereq: CHM 3210, 3200, or equivalent.* Classification of polymerization types and mechanisms from a mechanistic organic point of view. The structure of synthetic and natural polymers and polyelectrolytes. Reaction of polymers. Practical synthetic methods of polymer preparation.

CHM 5305—Chemistry of Biological Molecules (3) *Prereq: CHM 3211 or 3216 and 4412 or 3401 or consent of instructor.* Mechanistic organic biochemistry. Emphasis on model systems, enzyme active sites, and physical and organic chemistry of biomacromolecules.

CHM 5413L—Advanced Physical Chemistry Laboratory (2) *Prereq: CHM 4412L.* Techniques used in experimental research; techniques of design and fabrication of scientific apparatus. Advanced experiments involving optical, electronic, and high vacuum equipment.

CHM 5511—Physical Chemistry of Polymers (2) *Prereq: CHM 4411 or equivalent.* Structure, configuration, conformation, and thermodynamics of polymer solutions, gels, and solids. Thermal, mechanical, optical, and rheological properties of plastics and rubbers.

CHM 5511L—Polymer Chemistry Laboratory (2) *Prereq or coreq: CHM 5511.* Designed to accompany CHM 5511.

CHM 5514—Chemical Computations (2) *Prereq: CHM 4412 and knowledge of FORTRAN programming.* Solution of difficult chemical problems in equilibrium, kinetics, and spectroscopy. Applications of computers to chemical research—control of experimental procedures and data reduction.

CHM 6153—Electrochemical Processes (3) Principles of electrochemical methods, ionic solutions, and electrochemical kinetics.

CHM 6154—Chemical Separations (3) Theory and practice of modern separation methods with emphasis on gas and liquid chromatographic techniques.

CHM 6155—Spectrochemical Methods (3) Principles of atomic and molecular spectrometric methods; discussion of instrumentation, methodology, applications.

CHM 6158C—Electronics and Instrumentation (1-4; max: 6) Principles of operation of instruments, optimization of instrumental conditions, and interpretation of instrumental data for qualitative and quantitative analysis.

CHM 6165—Chemometrics (3) *Prereq: graduate standing.* Analytical method, information theory, and chemometrics, including statistical data analysis, heuristic and non-heuristic data analysis (pattern recognition and artificial intelligence), and experimental design and optimization.

CHM 6180—Special Topics in Analytical Chemistry (1-3; max: 9) *Prereq: two courses of graduate level analytical chemistry.* Lectures or conferences covering selected topics of current interest in analytical chemistry.

CHM 6190—Analytical Chemistry Seminar (1; max: 20) *Attendance required of graduate majors in the analytical area. Prereq: graduate course in analytical chemistry.* Presentation of one seminar. S/U option.

CHM 6225—Advanced Principles of Organic Chemistry (4) *Prereq: CHM 3211, 5224, 5235.* Principles of organic chemistry and their application to reaction mechanisms.

CHM 6226—Advanced Synthetic Organic Chemistry (3) *Prereq: CHM 6225.* Discussion and application of synthetic methodology.

CHM 6227—Topics in Synthetic Organic Chemistry (2) *Prereq: CHM 6226.* Synthesis of complex organic molecules, with emphasis on recent developments in approaches and methods.

CHM 6251—Organometallic Compounds (3) Properties of organometallic compounds, the nature of the carbon-metal bond, compounds of metals in groups 1, 2, 3, and 4, and transition metals.

CHM 6271—The Chemistry of High Polymers (2) Fundamental polymer chemistry, with emphasis on the mechanisms of polymerization reactions and the relationship of physical properties to chemical constitution.

CHM 6381—Special Topics in Organic Chemistry (1-3; max: 9) *Prereq: CHM 6225, 6226.* Chemistry of selected types of organic compounds, such as alkaloids, carbohydrates, natural products, steroids.

CHM 6390—Organic Chemistry Seminar (1; max: 20) *Attendance required of graduate majors in the organic area.* Presentation of one seminar. S/U option.

CHM 6430—Chemical Thermodynamics (3) Energetics, properties of ideal and nonideal systems primarily from the standpoint of classical thermodynamics.

CHM 6440—Advanced Chemical Kinetics (3) *Prereq: CHM 6720 or equivalent.* Rates and mechanisms of chemical reaction.

CHM 6449—Photochemistry (2) *Prereq: CHM 6440 or 6720.* Experimental and theoretical aspects of chemical reactions induced by visible and ultraviolet radiation. Fluorescence and chemiluminescence.

CHM 6461—Statistical Thermodynamics (3) *Prereq: CHM 6430.* Fundamental principles with applications to systems of chemical interest.

CHM 6470—Chemical Bonding and Spectra I (3) Basic methods and applications of quantum chemistry; atomic structure; chemical bonding in diatomic and polyatomic molecules. Brief introduction to molecular spectroscopy.

CHM 6471—Chemical Bonding and Spectra II (3) *Prereq: CHM 6470.* Theory of symmetry and its chemical applications; semiempirical molecular orbital treatment of simple inorganic and organic molecules; further applications to inorganic and organic chemistry.

CHM 6480—Elements of Quantum Chemistry (3) *Prereq: CHM 6471.* Brief treatment of the Schrodinger equation, followed by a survey of applications to chemical problems.

CHM 6490—Theory of Molecular Spectroscopy (3) *Coreq: CHM 6471.* Molecular energy levels, spectroscopic selection rules; rotational, vibrational, electronic, and magnetic resonance spectra of diatomic and polyatomic molecules.

CHM 6520—Chemical Physics (3) *Prereq: CHM 6470 or permission of instructor. Identical to PHZ 6247.* Topics from the following: intermolecular forces; molecular dynamics; electromagnetic properties of molecular systems; solid surfaces; theoretical and computational methods.

CHM 6580—Special Topics in Physical Chemistry (1-3; max: 12) Lecture or conferences covering selected topics of current interest in physical chemistry.

CHM 6590—Physical Chemistry Seminar (1; max: 20) *Attendance required of graduate majors in physical chemistry. Prereq: graduate course in physical chemistry.* Presentation of one seminar. S/U option.

CHM 6620—Advanced Inorganic Chemistry I (3) The crystalline state; covalent bonding; acids, bases, and solvents, nonmetallic compounds of Groups III through VII with emphasis on structure and reactivity.

CHM 6621—Advanced Inorganic Chemistry II (3) *Prereq: CHM 6620.* Electronic structure of metals and transition metal complexes; solution chemistry and reaction mechanisms at metal centers; redox reactions; introduction to organometallic and bioinorganic chemistry.

CHM 6623—Chemistry of the Metals (3) *Prereq: CHM 6471.* Relation of properties to atomic, molecular, and crystal structures.

CHM 6626—Applications of Physical Methods in Inorganic Chemistry (3) *Prereq: graduate standing or consent of instructor.* Principles and applications of spectroscopic methods to the solution of inorganic problems. Those techniques used most extensively in current inorganic research are treated.

CHM 6670—Inorganic Biochemistry (3) *Prereq: graduate standing or consent of instructor.* Role of elements in biology. Modern spectroscopic and physical methods for study of Group I and II

metals, metalloenzymes, metal ion transport and storage, functions of nonmetals in biochemical systems, and biomedical/biotechnical applications of metals.

CHM 6680—Special Topics in Inorganic Chemistry (1-3; max: 12) Lectures or conferences on selected topics of current research interest in inorganic chemistry.

CHM 6690—Inorganic Chemistry Seminar (1; max: 20) *Attendance required of graduate majors in inorganic chemistry. Prereq: graduate course in inorganic chemistry.* Presentation of one seminar. S/U option.

CHM 6710—Applied Molecular Spectroscopy (3) Applications and comparisons of methods in analysis and molecular structure determination.

CHM 6720—Chemical Dynamics (3) Basic concepts of rate laws, collision theory, and transition state theory; an introduction to reaction dynamics, structural dynamics, and quantitative structure-reactivity correlations.

CHM 6905—Individual Problems, Advanced (3-5; max: 10) *Prereq: consent of faculty member supervising the work.* Double registration permitted. Assigned reading program or development of assigned experimental problem. S/U option.

CHM 6910—Supervised Research (1-5; max: 5) S/U.

CHM 6935—Chemistry Colloquium (1; max: 7) Topics presented by visiting scientists and local staff members. S/U option.

CHM 6940—Supervised Teaching (1-5; max: 5) S/U.

CHM 6943—Internship in College Teaching (2, 4, 6; max: 6) *Prereq: graduate standing.* Required for Master of Science in Teaching students but available for students needing additional practice and direction in college-level teaching.

CHM 6971—Research for Master's Thesis (1-15) S/U.

CHM 7485—Special Topics in Theory of Atomic and Molecular Structure (1-3; max: 9) *Prereq: PHZ 6226 or equivalent.* Mathematical techniques used in atomic, molecular, and solid-state theory. The one-electron approximation and the general quantum-mechanical manybody problems. Selected advanced topics.

CHM 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.

CHM 7980—Research for Doctoral Dissertation (1-15) S/U.

CHS 5110—Radiochemistry (2) *Prereq: CHM 3401 or 4412 or consent of instructor.* Properties of radioactive nuclei, nature of radioactivity, nuclear structure, nuclear reactions, interaction of radiation with matter, chemical aspects of radioactivity, and applications of nucleonics to chemistry.

CHS 5110L—Radiochemistry Laboratory (3) *Prereq: CHM 3120C and 3401 or 4412, or consent of instructor.* Radioactivity detection, radiochemical separations and analyses, radiochemistry laboratory techniques, the practice of radiological safety, and tracer applications of radioisotopes in chemistry and other fields.

CIVIL ENGINEERING
College of Engineering

GRADUATE FACULTY 1993-94

Chairman: P. Y. Thompson. *Associate Chairman & Graduate Coordinator:* H.A. Bevis; *Graduate Research Professor:* R. G. Dean. *Distinguished Service Professor:* J. H. Schaub. *Professors:* B. A. Christensen; K. G. Courage; J. L. Davidson; D. U. Deere; D. S. Ellifritt; F. E. Fagundo; C. O. Hays; Z. Herbsman; W. C. Huber; A. J. Mehta; B. E. Ruth; M. Tia; F. C. Townsend; J. A. Wattleworth; J. Zoltek. *Engineer:* C. E. Wallace. *Associate Professors:* J. L. Eades; D. W. Gibson; K. Hatfield; M. I. Hoit; G. Long; J. M. Lybas; M. C. McVay; L. H. Motz; F. T. Najafi; R. Shrestha; S. E. Smith; W. H. Zimpfer. *Associate Engineer:* W. G. Shafer. *Assistant Professors:* G. Barnes; D. G. Bloomquist; R. Cook; B. Dewitt; R. Ellis.

The following graduate degrees are offered to prepare qualified students for the professional practice of civil engineering: Master of Civil Engineering, Master of Engineering, Master of Science, Engineer, and Doctor of Philosophy. All degree programs include areas of concentration in the specialities of construction, civil engineering management, geotechnical engineering, hydraulics, public works, structures, surveying and mapping, and transportation engineering. All degrees except the Ph.D. are available in a thesis or nonthesis program.

Nonthesis degree students usually must successfully complete a report of substantial engineering content for a minimum of two hours credit in CGN 6974. However, upon recommendation of the supervisory committee and the Department Chair, the student may substitute sufficient course work for the nonthesis report. Minor or supporting work is encouraged from a variety of related or allied fields of study.

Subject to approval by the supervisory committee, graduate level courses taken through the Departments of Aerospace Engineering, Mechanics, and Engineering Science; Coastal and Oceanographic Engineering; Environmental Engineering Sciences; and Geology are considered as major credit.

CCE 5035—Construction Planning and Scheduling (3) *Prereq: CCE 4204.* Planning, scheduling, organizing, and control of civil engineering projects with CPM and PERT. Application of optimization techniques.

CCE 5405—Construction Equipment and Procedures (2) *Prereq: CCE 4204 or consent of instructor.* Design and optimization of equipment systems for heavy construction.

CCE 6037—Civil Engineering Operations I (2) *Prereq: graduate status.* Advanced construction engineering and management procedures at the project level to support quantitative decision making.

CCE 6038—Civil Engineering Operations II (2) *Prereq: CCE 4204 or consent of instructor.* Advanced construction engineering techniques and management coordination procedures for civil engineering projects.

CCE 6505—Computer Applications in Construction Engineering (3) *Prereq: CGS 3422, CCE 5035, or consent of instructor.* Application of computer solutions to construction engineering/civil engineering management problems; microcomputer use.

CCE 6507—Computer Applications in Construction Engineering II (3) *Prereq: CGS 4161, CCE 6505 or consent of instructor.* Applications of advanced computer solutions to construction engineering/civil engineering management problems.

CEG 5115—Foundation Design (3) *Prereq: CEG 4012, CES 4702, or consent of instructor.* Investigations, bearing capacity, and the analysis and design of shallow footings, walls, and deep pile foundations.

CEG 5205C—Insitu Measurement of Soil Properties (3) *Prereq: CEG 4012.* Methods of soil exploration; techniques of soil sampling and insitu testing; field performance of insitu testing.

CEG 5605—Earth and Rockfill Dams (2) *Prereq: CEG 4012.* Design requirements, construction techniques, compaction control, soil testing and sampling, foundation preparation, and field instrumentation.

CEG 5805—Ground Modification Design (2) *Prereq: CEG 4012, CGS 3422.* Introduction to design of ground modification techniques for improvement of marginal construction sites.

CEG 6015—Advanced Soil Mechanics (3) *Prereq: CEG 4011, 4012, or consent of instructor.* Nature and origin of soil. Stresses within a soil body. Stress-strain behavior and shear strength of dry, saturated no flow, saturated transient flow soils.

CEG 6017—Theoretical Soil Mechanics (2) *Prereq: consent of instructor.* Nature of soil-water systems; analysis of stress, strains, equations of state; rheological behavior of soils; failure in soil media.

CEG 6116—Advanced Shallow Foundation Design (3) *Prereq: CEG 6105, CES 4702.* Application of soil mechanics to design and analysis of shallow foundations.

CEG 6117—Advanced Deep Foundation Design (3) *Prereq: CEG 6015.* Application of soil mechanics to design and analysis of deep foundations.

CEG 6125—Soil Stabilization (2) *Prereq: graduate standing or consent of instructor.* Highway soil stabilization, methods of stabilization, and behavior of materials.

CEG 6201—Experimental Determination of Soil Properties (3) *Prereq: CEG 4012 or consent of instructor.* Advanced laboratory tests, constant rate of strain consolidation, factors influencing stress-deformation response, elastic-plastic constitutive relationships, failure criteria. H.

CEG 6305—Rock Mechanics and Engineering Geology (2) *Prereq: CEG 4012.* Behavior of rock subject to stress. Application of rock mechanics and geology to the planning, design, and construction of engineering structures.

CEG 6405—Groundwater Problems in Geotechnical Engineering (2) *Prereq: CEG 4011, 4012, or consent of instructor.* Darcy's law, coefficient of permeability, flownets; seepage forces. Engineering applications-dewatering systems, slope stability, filter design, earth dams, drainage.

CEG 6505—Numerical Methods of Geomechanics (3) *Prereq: CGN 3421, CEG 6015 or consent of instructor.* Application of computer solutions to geotechnical engineering problems.

CEG 6506—Geotechnical Engineering Computer Aided Design (3) *Prereq: CEG 4012.* Use of geotechnical engineering software for CAD of deep and shallow foundations and earth retention systems.

CEG 6515—Earth Retaining Systems and Slope Stability (3) *Prereq: CEG 6015.* Applications of soil mechanics to design and analysis of earth retaining systems and slope stability.

CEG 6807—Advanced Geotechnical Engineering I (4) *Prereq: CEG 6015 or consent of instructor.* Application of soil mechanics to the design and analysis of settlement, slope stability, and bearing capacity problems.

CEG 6808—Advanced Geotechnical Engineering II (4) *Prereq: CEG 6015 or consent of instructor.* Application of soil mechanics to the design and analysis of pile foundations and earth pressure problems.

CES 5116—Finite Elements in Civil Engineering (3) *Prereq: CES 4141.* Introduction to finite elements, use of finite element concepts for structural analysis. Application of 1-, 2-, and 3-D elements of structural problems.

CES 5305—Design of Structural Systems (2) *Prereq: CES 4605, 4702.* Fundamental characteristics of structural systems. Economic and architectural considerations. Building frames and connections. Plate girders. Special structures.

CES 5325—Design of Highway Bridges (3) *Prereq: CES 4605, 4702.* Analysis by influence lines, slab and girder bridges, composite design, prestressed concrete, continuity, arch bridges, design details, highway specifications.

CES 5606—Topics in Steel Design (3) *Prereq: CES 4605.* Plate girders, torsion, biaxial bending, frame design, composite beams and columns, fatigue, monosymmetric members, and moment connections.

CES 5607—Behavior of Steel Structures (3) *Prereq: CES 4605.* Plastic analysis and designs of beams and frames. Buckling and stability problems. Connections.

CES 5715—Prestressed Concrete (3) *Prereq: CES 4702.* Analysis and design of prestressed concrete flexural members; pre- and post-tensioned construction, allowable stress, strength evaluation; design for bending moments and shear; evaluation of serviceability requirements; design of simple bridges.

CES 5726—Design of Concrete Systems (3) *Prereq: CES 4702.* Strength design of members and frames, torsion, two-way slabs, design of building systems, prestressed concrete.

CES 5801—Design and Construction in Timber (2) *Prereq: consent of instructor.* Analysis and design in timber. Beams, columns, and connections. Timber structure. Plywood beams, panels, diaphragms. Laminated beams and frames. Formwork.

CES 5835—Design of Reinforced Masonry Structures (3) *Prereq: CES 4702.* Properties of clay brick, concrete block and mortar, beams and columns, structural walls, joints and details.

CES 6106—Advanced Structural Analysis I (4) *Prereq: CES 4605, 4702.* Traditional methods of analyses for forces and deformations; modern matrix methods including direct stiffness method.

CES 6108—Advanced Structural Analysis II (3) *Prereq: EGM 3400, CES 6106.* Evaluation of structural response to the effect of dynamic loads for single- and multidegree of freedom systems. Consideration of seismic and wind effects, modal analysis, numerical methods, structural idealization, response spectra, and design codes.

CES 6136—Advanced Structural Laboratory (2) *Prereq: CES 4605, 4702.* Model studies and analysis. Mechanics of similitude and dimensional analysis applied to static and dynamic structural problems. Research topics. Experimental stress analysis. Instrumentation.

CES 6165—Computer Methods in Structural Engineering (3) *Prereq: CGS 3422, CES 6106.* Modern program development techniques for structural analysis. Efficiency, databases, modularity, equation solving, and substructure programming concepts.

CES 6526—Nonlinear Structural Analysis and Design (2) *Prereq: CES 6108.* Sources of nonlinearity. Tangent stiffness method. Beam-columns on elastic foundations. Discrete methods for soil-structure interaction.

CES 6551—Design of Folded Plates and Shells (3) *Prereq: CES 4605, 4702.* Analysis for membrane stresses; pressure vessels, secondary bending stresses. Design of shell systems and folded plates. Design details.

CES 6706—Advanced Reinforced Concrete (3) *Prereq: CES 4704, 5726.* Torsion in structural members. Ultimate load theories and application to design. Yield-line theory for slabs. Shear walls, combined shear walls and frames. Research topics.

CGN 5115—Civil Engineering Feasibility Analysis (3) *Prereq: CGN 4101 or equivalent studies in time-value of money.* Theory and practice of feasibility studies for proposed civil engineering projects and other related areas of interest.

CGN 5125—Legal Aspects of Civil Engineering (3) Engineer's view of contracts for design and construction. Legislation and policy affecting labor-management relationships in construction.

CGN 5135—Value Engineering Theory (3) Value engineering concepts, function analysis system techniques (FAST), diagramming, creativity, matrix evaluation, design-to-cost, life cycle costing, human relations and strategies for organizing, performing, and implementing value engineering work.

CGN 5315—Civil Engineering Systems (3) Civil engineering applications of operations research techniques, models of scheduling, linear programming, queueing theory, and simulation.

CGN 5508—Experimentation and Instrumentation in Civil Engineering Materials Research (3) Fundamentals and applications of testing and measuring systems commonly used; constitutive models, testing methods, instrumentation, and error analysis.

CGN 5605—Public Works Planning (3) Functional approach to planning and implementing public works needs with emphasis on role of engineer.

CGN 5606—Public Works Management (3) Nature of profession, duties, and administrative responsibilities. Organization and management of operating divisions with emphasis on role of engineer.

CGN 5805—Civil Engineering Design (3) Practical problems in civil engineering design taught by practicing engineers.

CGN 6155—Civil Engineering Practice I (2) *Prereq: graduate status.* Advanced civil engineering management skills and procedures in support of design and construction practices above the project level.

CGN 6156—Civil Engineering Practice II (2) *Prereq: CCE 4204 or consent of instructor.* Advanced construction engineering management and productivity topics above the project level.

CGN 6505—Properties, Design and Control of Concrete (3) *Prereq: CGN 3501.* Portland cement and aggregate properties relating to design, control, and performance of concrete. Concrete forming and construction methods. Laboratory testing and analysis.

CGN 6506—Bituminous Materials (3) *Prereq: TTE 4811.* Analysis of strength and deformation mechanism for asphalt concrete, properties, and their effect on flexible pavement performance. Pavement construction and quality assurance methods, testing and evaluation of asphalts and mixture.

CGN 6507—Advanced Bituminous Materials (3) *Prereq: CGN 6506.* Effects of asphalt rheology, temperature susceptibility, durability, characteristics of mineral filler and additives on performance of asphalt pavements. Detailed analysis and design of asphalt pavements against rutting and cracking.

CGN 6905—Special Problems in Civil Engineering (1-6; max: 10) Studies in areas not covered by other graduate courses.

CGN 6910—Supervised Research (1-5; max: 5) Credits do not apply to any graduate degree. S/U.

CGN 6936—Civil Engineering Graduate Seminar (1; max 6) Lectures by graduate students, faculty members, and invited speakers. S/U.

CGN 6940—Supervised Teaching (1-5; max: 5) Credits do not apply to any graduate degree. S/U.

CGN 6971—Research for Master's Thesis (1-15) S/U.

CGN 6972—Research for Engineer's Thesis (1-15) S/U.

CGN 6974—Master of Engineering or Engineer Degree Report (1-6; max: 6) Individual work culminating in a professional practice-oriented report suitable for the requirements of the Master of Engineering or Engineer degree. Two credits only are applicable toward the requirements of each degree. S/U.

CGN 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students

with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.

CGN 7980—Research for Doctoral Dissertation (1-15) S/U.

CWR 5125—Groundwater Flow I (3) *Prereq: CWR 4202 or consent of instructor.* Porous media flow. Darcy's law. Conservation of mass. LaPlace equation. Flownets. Well hydraulics.

CWR 5127—Evaluation of Groundwater Quality (3) *Prereq: CWR 5125 or 6525, or consent of instructor.* Characteristics of flow in saturated and unsaturated zones; solute convection and dispersion; effects of chemical reactions and adsorption; management of groundwater quality.

CWR 5225—Hydraulics Machinery (2) *Prereq: CWR 4202 or consent of instructor.* Selection and operation of hydraulic motors, pumps and transmissions. Specific speed. Cavitation. Surge tanks.

CWR 5235—Open Channel Hydraulics (3) *Prereq: CWR 4202 or consent of instructor.* Classification of flow, Normal depth. Specific energy and critical depth. Gradually varied flow. Transitions.

CWR 6126—Groundwater Management (3) *Prereq: CWR 5125 or consent of instructor.* Review recent developments in groundwater systems planning and management, optimization methods; groundwater supply management models, quality management models; inverse problems.

CWR 6206—Hydraulics of Stratified Flow (2) *Prereq: CWR 5235 or consent of instructor.* Uniform and nonuniform flow in multilayered systems. Oscillatory motion and interfacial mixing.

CWR 6236—Sediment Transport I (3) *Prereq: CWR 5235 or consent of instructor.* Introduction to movable bed models. Sediment properties. Scour initiation. Influence of slope. Stable channels. Bed forms. Transport as bed load and suspended transport.

CWR 6237—Sediment Transport II (2) *Prereq: CWR 6236 or consent of instructor.* Review of fundamental laws of scour initiation and sediment transport. River morphology. Movable bed hydraulic models.

CWR 6238—Transient Flows in Open Channels (3) *Prereq: CWR 5235 or consent of instructor.* Basic equations for unsteady flows in open channels; methods of characteristics; finite difference approximations; flood routing.

CWR 6255—Diffusive and Dispersive Transport (2) *Prereq: CWR 4202 or consent of instructor.* Introduction to diffusive and dispersive transport processes in flowing water. Fick's law. Available analytical and numerical models.

CWR 6275—Hydraulic Laboratory and Field Practice (3) *Prereq: CWR 4202 or consent of instructor.* Hydraulic model laws and their use in undistorted and distorted models with movable or fixed beds. Instrumentation. Data acquisition system.

CWR 6285—Transient Flow in Pipes (3) *Prereq: CWR 5235 or consent of instructor.* Water hammers in singular pipes and systems. Governing differential equations. Numerical methods. Turbomachine-induced transients. Control measures.

CWR 6515—Numerical Models in Hydraulics (3) *Prereq: CWR 4202 or consent of instructor.* Application of numerical methods to hydraulic engineering problems; dispersion, porous media flow, river and estuarine mechanics, thermal diffusion.

CWR 6525—Groundwater Flow II (3) *Prereq: CWR 5125 or consent of instructor.* Analytical and computer modeling of groundwater flow problems by means of finite difference, finite element, and boundary element methods.

SUR 5365—Digital Mapping (3) *Prereq: consent of instructor.* Methods of digital representation of maps, coordinate development, digitizing, stereocompilation, scanning, remote sensing, hardware and software systems, file conversion, integration into GIS systems, attribute development.

SUR 5385—Remote Sensing Applications (3) *Prereq: consent of instructor.* Review of remote sensing systems, image classification methods, mapping applications, integration of remotely sensed data into GIS systems, application of data for variety of land information systems.

SUR 5425—Cadastral Mapping (3) *Prereq: consent of instructor.* Methods of cadastral mapping for tax and/or GIS applications; interpretation of deed and survey information, the sectional survey system, conflict resolution, cadastral information.

SUR 5516—Coordinate Systems for Mapping (3) *Prereq: consent of instructor.* Review of systems, geodetic positions, projection systems, national datums in use, coordinate conversions, measurement of position, use in GIS systems.

SUR 5545—Least Squares Adjusted Computations (3) *Prereq: proficiency in computer language and consent of instructor.* Implementation of least squares solutions for survey-mapping and GIS applications, time and storage optimization; error analysis; initial approximation generation; robust estimation; computer programming.

SUR 6375—Terrain Analysis and Mapping (3) *Prereq: consent of instructor.* Digital and visual methods, interpretative techniques to identify landforms, soils, and potential site analysis problems from aerial photography and digital maps.

SUR 6388—Radar Remote Sensing (3) *Prereq: consent of instructor.* Electromagnetic principles of microwave transmission, propagation, and reception by remote sensing instruments. Types of radar devices currently used in applications of radar to remote sensing.

SUR 6395—Topics in Geographic Information Systems (3; max: 6) *Prereq: consent of instructor.* Data base development, economic impact of GIS, development of standards, integration of data sets, hardware and software developments, advances in GIS technology.

TTE 5006—Transportation Systems Planning (4) *Prereq: graduate standing or consent of instructor.* Analytical techniques for estimating future travel demands, planning, transportation facilities and locations. Review of transportation technology and future systems.

TTE 5256—Traffic Engineering (4) *Prereq: TTE 4811 or consent of instructor.* Traffic studies, operations, flow, signals, signs and markings; regulation of traffic, pedestrian and bicycle operation, parking lot operations, highway lighting.

TTE 5805—Geometric Design of Transportation Facilities (3) *Prereq: TTE 4811 or consent of instructor.* Geometric design criteria and controls of highways and intersections.

TTE 5835—Pavement Design (2) *Prereq: TTE 4811 or consent of instructor.* Design of flexible and concrete pavements.

TTE 5837—Pavement Management Systems (3) *Prereq: TTE 5835.* Evaluation, analysis, design, performance prediction, planning, and maintenance of pavements.

TTE 6257—Traffic Control Systems (4) *Prereq: TTE 5256 or consent of instructor.* Traffic controller operation, computer controlled signal systems, modeling and optimization of traffic control systems, system selection implementation and management.

TTE 6315—Highway Safety Analysis (3) Statistics and characteristics of accidents, accident reconstruction, accident causation and reduction.

TTE 6526—Airport Planning and Operations (2) *Prereq: TTE 6257.* Location, configuration, air connections; ground, baggage, and freight movements; passenger transfers; aircraft delay analysis; airport access; parking needs; simulation of operations; flight scheduling and control.

TTE 6606—Urban Transportation Models (4) *Prereq: CGN 4421 or consent of instructor.* Calibration and application of UTPS computer models for urban transportation planning; land use and urban activity models for forecasting and allocation. H.

TTE 6815—Freeway Design and Operations (3) *Prereq: TTE 5256.* Operations of freeway systems, effects of design, advanced analysis techniques, freeway optimization techniques.

CLASSICS
College of Liberal Arts and Sciences

GRADUATE FACULTY 1993-94

Chairman: L. A. Sussman. *Graduate Coordinator:* D. G. Miller. *Professors:* K. V. Hartigan; A. L. Motto;* G. L. Schmeling; D. C. Young. *Associate Professors:* S. K. Dickison; D. G. Miller; L. A. Sussman. *Assistant Professor:* R. S. Wagman.

**This member of the faculty of the University of South Florida is also a member of the graduate faculty of the University of Florida and participates in the master's program in the University of Florida Department of Classics.*

The Department offers programs leading to the Master of Arts with a major in classics or Latin, which may be combined with a minor in history or philosophy. The nonthesis degree, Master of Arts in Teaching, is also offered with a major in Latin.

GRE 6735—Ancient Greek Dialects (3) Major changes in ancient Greek dialects from Mycenean to late Greek.
GRE 6745—Structure and History of Ancient Greek (3) To develop understanding of synchronic structure of ancient Greek as well as of diachronic changes.
GRW 6216—Greek Novel (3; max: 6) Selections from ancient Greek novels.
GRW 6306—Greek Drama: Aeschylus I (3) Reading of *Agamemnon*.
GRW 6307—Greek Drama: Aeschylus II (3) Reading of *Choephori* and *Eumenides*.
GRW 6345—Greek Lyric Poetry (3; max: 6) Variety and peculiarities of lyric content, style, grammar, structure, dialect, and meter shown through selected poems.
GRW 6346—Pindar (3; max: 6) Selected poems.
GRW 6347—Homer (3; max: 6) Reading's from *Iliad* and *Odyssey*.
GRW 6385—Thucydides (3; max: 6) Selected books from Thucydides.
GRW 6506—Plato (3; max: 6) Reading of *Symposium* and selected books of the *Republic*.
GRW 6507—Ethical Traditional in Archaic Greek (3) Early Greek poets of the ethical tradition: Hesiod, Solon, Theognis.
GRW 6795—Hellenistic Literature (3; max: 6) Reading of selections from poets and prose writers.
GRW 6931—Comparative Study of Greek and Latin Literature (3) Study of genre types.
LAT 6425—Latin Prose Composition (3) Translating English into Latin and imitation of various Latin prose styles.
LAT 6845—History of the Latin Language (3)
LNW 5325—Roman Elegiac Poetry (3; max: 6) Readings from the elegies of Catullus, Tibullus, Propertius, and Ovid. Elegy as a genre.
LNW 5335—Roman Orators (3; max: 6) Theory and practice of Roman oratory through Latin readings in Cicero, Seneca, and Quintilian.
LNW 5385—Roman Historians of the Empire (3; max: 6) Readings from major historians of the period. Tacitus, Suetonius.
LNW 5655—Roman Poets: Horace (3; max: 6) Horace's lyric poetry (the *Odes*).
LNW 5665—Roman Poets: Vergil (3; max: 6) The poetic art of Vergil and its literary, historical, and political background.
LNW 5675—Roman Poets: Ovid (3; max: 6) Ovid's poetic art against its literary, historical, and political background.
LNW 5931—Comparative Study of Latin and Greek Literature (3; max: 6) Study by genre types, variable.
LNW 6015—History of Latin Literature (3) A comprehensive survey of the development of Latin literature from Plautus to Juvenal.
LNW 6225—The Ancient Roman Novel (3; max: 6) Readings from Petronius and/or Apuleius.
LNW 6355—Roman Epistolography (3; max: 6) Letters from Cicero, Pliny, Seneca, Ovid, and Horace. Emphasis on appreciation of Latin style.
LNW 6365—Studies in Roman Satire (3; max: 6) Readings from Horace, Persius, Petronius, Juvenal, Martial.
LNW 6495—Late Latin Literature (3) Readings from one or more of the following: Vulgate, Christian Church Fathers, Historia Apollonii, Peregrinatio Aetheriae, Harrington's Medieval Latin.
LNW 6905—Individual Work (2-4; max: 10) Readings and reports in language and literature.
LNW 6910—Supervised Research (1-5; max: 5) S/U.
LNW 6930—Proseminar in Classics (3) Introduction to the study of classical literature, history of scholarship, bibliographies, areas of the discipline.
LNW 6940—Supervised Teaching (1-5; max: 5) S/U.
LNW 6943—Internship in College Teaching (2,4,6; max: 6) Required for all Master of Arts in Teaching candidates but available for students needing additional practice and direction in college-level teaching.
LNW 6971—Research for Master's Thesis (1-15) S/U.

CLINICAL AND HEALTH PSYCHOLOGY
College of Health Related Professions

GRADUATE FACULTY 1993-94

Chairman: N. W. Perry. *Graduate Coordinator:* C. D. Belar. *Graduate Research Professor:* P. J. Lang. *Professors:* B. Barger (*Emeritus*); C. D. Belar; W. K. Berg; R. K. Blashfield; L. D. Cohen (*Emeritus*); W. R. Cunningham; H. Davis (*Emeritus*); S. M. Eyberg; E. B. Fennell; I. S. Fishler; J. R. Goldman; J. Graham-Pole; M. Harrower (*Emeritus*); M. Heft; K. Heilman; J. H. Johnson; S. B. Johnson; C. M. Levy; M. E. Meyer; W. L. Mealiea; M. G. Perri; N. W. Perry; B. R. Schlenker; R. T. Watson. *Associate Professors:* R. M. Bauer; S. R. Boggs; D. Bowers; B. A. Crosson; G. R. Geffken; R. K. Hornberger; W. J. Rice; M. E. Robinson; J. Silverstein; R. L. West; K. D. White. *Assistant Professors:* D. E. Dede; M. E. Geisser; A. F. Greene; J. R. Rodrigue. *Assistant Scientist:* B. Cuthbert.

The Department of Clinical and Health Psychology is a unit of the College of Health Related Professions. The Department's programs are its doctoral clinical psychology studies leading to the Ph.D. degree in psychology; the Center for Clinical and Health Psychology, a teaching and service unit of the Shands Hospital; an American Psychological Association accredited doctoral internship program; and postdoctoral studies and research. The Master of Science degree is offered as part of the doctoral program studies.

The clinical psychology curriculum has academic ties with other colleges and departments within the University and with the training and service programs of the Veterans Administration Medical Center.

Progress in the program is determined by departmental policies which are consistent with American Psychological Association accreditation standards. The curriculum has been continuously accredited by the American Psychological Association since 1953.

Admission to the Department is through appropriate application to the Department's admission committee. A bachelor's degree is generally adequate preparation for graduate admission. It should include undergraduate courses in both experimental psychology and statistics, along with at least three courses from the following psychology areas: developmental, learning, perception, personality, physiological, and social.

CLP 6375—Introduction to Clinical Psychology (1-3; max: 3) *Prereq: admission to CLP.* Seminar on issues and concepts concurrent with field observation and participation.
CLP 6407—Psychological Treatment I (3) *Prereq: admission to CLP or consent of instructor.* Current dynamic and personality theories, practices, and related research in psychotherapy.
CLP 6417—Psychological Treatment II (3) *Prereq: admission to CLP or consent of instructor.* Current behavioral theories, practices, and related research.
CLP 6437—Behavioral Assessment (3) *Prereq: admission to CLP or consent of instructor.* Research, theory, and basic procedures including observational and interview techniques.
CLP 6446—Psychological Assessment of Children (3) *Prereq: admission to CLP or consent of instructor.* Developmental, intellectual, visual-motor, achievement, and personality assessment of children.
CLP 6447—Psychological Assessment of Adults (3) *Prereq: admission to CLP or consent of instructor.* Basic theories, procedures and administration experience in assessment of adult intellect and personality factors.
CLP 6449—Life History Research in Psychopathology (3) *Prereq: CLP 6497 or consent of instructor.* Recent and longitudinal developments in life history approaches to psychopathology and related behavioral disorders.
CLP 6497—Psychopathological Disturbances (3) *Prereq: admission to CLP or PSY or consent of instructor.* Theories and related research to etiology, clinical description, and diagnosis with implications for treatment.
CLP 6526—Introduction to Clinical Research and Design (2) *Prereq: admission to CLP or PSY or consent of instructor.* Survey emphasizing both laboratory and clinical experiment methodology; computer data analysis techniques employed.
CLP 6905—Individual Work (1-4; max: 12) Reading or research in areas in clinical psychology.
CLP 6910—Supervised Research (1-4; max: 5) S/U.
CLP 6940—Supervised Teaching (1-5; max: 5) S/U.

CLP 6943—Practicum in Clinical Psychology (1-4; max: 8) *Prereq: CLP 6375, consent of program director.* Supervised training in appropriate work settings. S/U.
CLP 6945—Practicum in Neuropsychology (1-3; max: 3) *Prereq: CLP 7427, consent of area head and program director.* Supervised clinical experience in neuropsychological assessment and cognitive rehabilitation of patients with neurologic impairments. S/U.
CLP 6946—Practicum in Applied Medical Psychology (1-3; max: 8) *Prereq: consent of area head and program director.* Supervised clinical experience in inpatient and outpatient consultation, assessment and intervention with psychosomatic, stress-related, and somatopsychic disorders. S/U.
CLP 6947—Advanced Practicum in Clinical Psychology (1-4; max: 8) *Prereq: consent of program director.* Designed for individual with special interests and needs. S/U.
CLP 6948—Practicum in Clinical Child Psychology (1-3; max: 8) *Prereq: CLP 6943, consent of area head and program director.* Supervised clinical experiences working with children or adolescents in either inpatient or outpatient settings. S/U.
CLP 6971—Research for Master's Thesis (1-15) S/U.
CLP 7404—Special Issues, Methods, and Techniques in Psychological Treatment (3; max: 12) *Prereq: CLP 6375, 6407, 6417, or consent of instructor.*
CLP 7406—Psychodynamic Theory (3; max: 6) *Prereq: CLP 6375, 6407, 6417, or consent of instructor.* Emphasis on disturbed adolescents and young adults.
CLP 7409—Marital Dysfunction (3) *Prereq: CLP 6375, 6407, 6417.* Issues, problems, and techniques of psychotherapy with couples.
CLP 7427—Neuropsychological Assessment of Children (3) *Prereq: PSB 6067 or consent of instructor.* Research, theory, and basic procedures.
CLP 7428—Neuropsychological Assessment of Adults (3) *Prereq: PSB 6067 or consent of instructor.* Research, theory, and basic procedures.
CLP 7438—Selected Methods in Clinical Assessment (3; max: 12) *Prereq: CLP 6437.*
CLP 7445—Projective Assessment (3) *Prereq: CLP 6375, 6446, 6447, 6497.* Current theory, research, and practice with projective assessment techniques, primary emphasis on Rorschach.
CLP 7468—Clinical Treatment with Groups (3) Current theories and practices of group therapy as a form of psychological treatment. Exploration of group therapy intervention techniques.
CLP 7488—Clinical Treatment of Adolescents (3) *Prereq: CLP 6375, 6407, 6417.* Application of a variety of treatment techniques.
CLP 7936—Health Psychology and Behavioral Medicine (3) *Prereq: admission to CLP or consent of instructor.* Seminar on the relevance of psychological research and clinical practice for medical patient population.
CLP 7942—Practicum in Behavior Therapy (3) *Prereq: CLP 6375, 6407, 6417.* Application of behavioral treatment techniques to actual patient and client needs.
CLP 7949—Internship (3; max: 6) *Prereq: admission to candidacy for the doctorate, successful completion of the qualifying examination and consent of the program director.* Reading assignments and conferences. Must include 1500 work hours; designed as a two semester sequence.
CLP 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.
CLP 7980—Research for Doctoral Dissertation (1-15) S/U.
DEP 6216—Psychological Disturbances of Children (3) *Prereq: admission to CLP or PSY or consent of instructor.* Stresses both affective and cognitive.
DEP 7408—Clinical Psychology of Aging (3) *Prereq: consent of instructor.* A developmental sequence that focuses on the psychopathology, neuropsychology, and treatment issues confronting the clinician dealing with an aged population.
PSB 6067—Human Brain Function (3)

COASTAL AND OCEANOGRAPHIC ENGINEERING
College of Engineering

GRADUATE FACULTY 1993-94

Chairman: R. G. Dean. *Graduate Coordinator:* A. J. Mehta. *Graduate Research Professor:* R. G. Dean. *Professors:* A. J. Mehta; M. K. Ochi; Y. P. Sheng; D. M. Sheppard; H. Wang. *Associate Professor:* D. M. Hanes. *Assistant Professor:* R. J. Thieke.

The Department offers the Master of Engineering, Master of Science, Engineer, and Doctor of Philosophy degrees in coastal and oceanographic engineering.

Areas of specialization include coastal engineering, oceanographic engineering, and offshore structures. A number of other courses on related subjects, within and outside of the College of Engineering are available for graduate credit in this department.

EGM 5816—Intermediate Fluid Dynamics (4) *Prereq: EGN 3353, MAP 3302.* Basic laws of fluid dynamics, introduction to potential flow, viscous flow, boundary layer theory, and turbulence.
EOC 5860—Port and Harbor Engineering (3) *Prereq: OCE 3016.* Principles of port design; wave penetration; harbor oscillations; sediment movement and pollutant mixing; port structures, port operations; case studies.
EOC 6196—Littoral Processes (3) *Prereq: OCP 6165.* Shoreline developments; nearshore hydrodynamics; sediment transport phenomena by waves and wind; methods of determining littoral transport quantities; effects of groins, jetties, and other coastal structures on littoral processes.
EOC 6425—Hydrodynamics of Coastal and Ocean Structures (3) *Prereq: EOC 5052, STA 5855.* Wave loads on fixed structures; forces on a pile due to regular and irregular waves, forces on marine structures. Wave loads on floating structures; inertia, damping and hydrostatic forces, equation of motions in regular waves, evaluation of loads in random seas.
EOC 6430—Coastal Structures (3) *Prereq: OCP 6165.* Planning and design for beach nourishment, breakwaters, jetties, seawalls and coastal protection structures.
EOC 6431—Offshore Structures (3) *Prereq: OCP 6165.* Design and analysis of fixed offshore steel structures including force computations, foundation design, stress and deformation, member design, and structural response.
EOC 6850—Numerical Simulation Techniques in Coastal and Ocean Engineering (3) Numerical treatment of problems in ordinary and partial differential equations with application to incompressible geophysical fluid flows.
EOC 6905—Individual Study in Coastal and Oceanographic Engineering (1-4; max: 8)
EOC 6932—Selected Field and Laboratory Problems (3) Field and/or laboratory investigations employing modern research techniques and instrumentation.
EOC 6934—Advanced Topics in Coastal and Oceanographic Engineering (1-6; max: 9) Waves; wave-structure interaction; coastal structures; ocean structures; sediment transport; instrumentation; advanced data analysis techniques.
EOC 6939—Graduate Seminar (1; max: 6) Guest lecturers; lectures by COE faculty and students. S/U.
EOC 6971—Research for Master's Thesis (1-15) S/U.
EOC 6972—Research for Engineer's Thesis (1-15) S/U.
EOC 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.
EOC 7980—Research for Doctoral Dissertation (1-15) S/U.

OCP 5293—Coastal Processes (3) *Prereq: working knowledge of basic fluid mechanics.* Coastal wave and water level fluctuations, littoral transport; tidal inlet dynamics, estuarine hydrodynamics, and sediment transport; techniques of measurements.

OCP 6056—Physical Oceanography (3) *Prereq: MAP 3302, EGN 3353.* Structure of ocean basins; physical and chemical properties of sea water; basic physical laws used in oceanography; ocean current; thermohaline effects; numerical models; heat budget.

OCP 6165—Ocean Waves I: Linear Theory (3) *Prereq: MAP 3302, EGN 3353.* Ocean wave classification, solution of the linearized boundary value problem; simple harmonic waves; shoaling effects; internal waves.

OCP 6165L—Ocean Waves Laboratory (1) Laboratory for linear wave theory. Basic measurement techniques and properties of water waves.

OCP 6167—Ocean Waves II: Nonlinear Theory (3) *Prereq: OCP 6165.* Perturbation development of nonlinear water wave theories; regions of validity of various theories; dynamics and kinematics of nonlinear wave trains composed of single and multiple fundamental components.

OCP 6168—Data Analysis Techniques for Coastal and Ocean Engineers (3) Data editing, fundamentals of spectral analysis, subsurface and surface signal analysis, directional spectral analysis.

OCP 6169—Random Sea Analysis (3) *Prereq: STA 5855, OCP 6165.* Mathematical presentation of random seas; wave spectral analysis, spectral formulations; joint prediction of wave height and period, directionality of random seas, bispectral analysis; principle of hindcasting and forecasting seas.

OCP 6256—Geophysical Fluid Dynamics (3) *Prereq: EGM 5816, OCP 6056.* Fundamental equations of motion for a rotating ocean, behavior of a stratified ocean, thermohaline circulation, shelf waves, turbulence theory, oceanic turbulence, and boundary layers.

OCP 6295—Estuarine and Shelf Hydrodynamics I (3) *Prereq: OCP 6056.* Kinematics and dynamics of estuaries, small scale motions, tidal hydrodynamics, nontidal circulations, shelf waves, estuary and shelf interactions, mathematical models.

OCP 6296—Estuarine and Shelf Hydrodynamics II (3) *Prereq: OCP 6056.* Statistical theory of turbulence, turbulent diffusion in estuaries and oceans, effects of density stratification, turbulent boundary layers, dispersion of contaminants.

OCP 6297—Coastal Cohesive Sediment Transport (3) Clay properties including cohesion and flocculation mechanisms; sediment settling velocity, deposition, and erosion processes; bed properties including consolidation and rheology; behavior and transport of fluid mud; wave-mud interactions; particle-bound contaminant transport; sedimentation issues; measurement strategies.

OCP 6655—Coastal Sediment Transport Processes (3) *Prereq: CWR 6236, OCP 6165.* Physical sedimentation processes, including boundary layer hydrodynamics, suspended sediment dynamics, and bedload mechanics under wave and current conditions.

STA 5855—Stochastic Processes for Coastal and Ocean Engineers (3) *Prereq: undergraduate calculus.* Principles of spectral analysis; cross-spectral analysis; linear-system; threshold crossing and prediction of period; prediction of random amplitudes; prediction of extreme values and its application to coastal and ocean engineering problems.

COMMUNICATION PROCESSES AND DISORDERS

College of Liberal Arts and Sciences

GRADUATE FACULTY 1993-94

Chair: W. S. Brown, Jr. *Graduate Coordinators:* A. J. Clark (Communication Studies); P. B. Kricos (Communication Sciences and Disorders). *Distinguished Service Professor:* G. P. Moore *(Emeritus). Professors:* T. B. Abbott *(Emeritus);* W. S. Brown, Jr.; K. R. Bzoch; R. H. Carpenter; N. J. Cassissi; M. A. Crary; K. J. Gerhardt; L. C. Hammer; H. F. Hollien; P. J. Jensen; F. J. Kemker; P. B. Kricos; L. J. Lombardino; N. N. Markel; G. E. Merwin; H. B. Rothman; R. J. Scholes; G. T. Singleton; A. Wehlburg; D. E. Williams. *Associate Professors:* A. J. Clark; R. J. Cline; A. T. Dyson; L. P. Goldstein; L. J. Gonzalez-Rothi; A. E. Holmes; W. N. Williams. *Assistant Professors:* W. H. Cutler; S. K. Griffiths.

Graduate programs in the Department lead to Master of Arts and Doctor of Philosophy degrees in communication processes and disorders. Students may pursue areas of specialty in communication sciences or disorders. Major areas of emphasis in communication sciences and disorders include audiology, phonetic science, and speech-language pathology. Students, in conjunction with their supervisory committees, develop graduate programs to meet their specific needs and interests. The master's degree specializations in speech-language pathology and audiology are accredited by the Educational Standards Board of the American Speech-Language-Hearing Association.

Students must contact the appropriate graduate coordinator to obtain information about specific specialty requirements. Entering graduate students with deficiencies in the major area of study must fulfill basic prerequisites to graduate work.

COM 5001—Introduction to Research in Communication Studies (3) *Required of all graduate students specializing in communication studies.*

COM 6015—Seminar in Communication and Gender (3) *Prereq or coreq: COM 5001 or consent of instructor.* Theoretical relationships between communication and the formation and enactment of sex roles. Sex differences in communication and implications of those differences.

COM 6016—Seminar in Communication and Culture (3) *Prereq or coreq: COM 5001 or consent of instructor.* Critical examination of role culture plays in human communication.

COM 6018—Seminar in Listening (3) *Prereq: COM 5001, equivalent, or consent of instructor.* Theory and research related to comprehensive, critical, discriminative, therapeutic, and appreciative listening.

COM 6019—Seminar in Problems in Interpersonal Communication (3) *Prereq: COM 5001, equivalent, or consent of instructor.* Theory and research related to typically dysfunctional interpersonal communicative behaviors; including communication apprehension, social alienation, disconfirmation, deception, and stigma.

COM 6025—Seminar in Health Communication (3) *Prereq or coreq: COM 5001 or consent of instructor.* Theory and research relevant to role of communication processes in health care and health promotion.

COM 6026—Seminar in Marital and Family Communication (3) *Prereq: COM 5001 and course in interpersonal communication or consent of instructor.* Theory and research on typical communication patterns in romantic dyad and/or family group in contemporary American culture.

COM 6027—Seminar in Interpersonal Communication in Health Care and Promotion (3) *Prereq or coreq: COM 5001 or consent of instructor.* Theory, research, and application of role of interpersonal communication in health care and health promotion.

COM 6300—Introduction to Graduate Research (3) *Required of all graduate students specializing in speech-language pathology or audiology.*

COM 6312—Seminar in Experimental Research in Communication Studies (3) Research strategies in communication studies with emphasis on evaluation of experimental research design and methods.

COM 6400—Seminar in Communication Theory (3) *Prereq or coreq: COM 5001 or equivalent.* Analysis of theories of human communication; issues in theory building.

COM 6467—Seminar in Communication and Aging (3) Theory and research concerning elders' use of mass media and interpersonal channels of communication. Physiological changes that mitigate effective communication.

COM 6706—Seminar in Language and Communication (3) *Prereq/coreq: COM 5001 or consent of instructor.* Examination of language and communication emphasizing a semiotic perspective.

COM 6905—Individual Study (1-3; max: 9) *Prereq: COM 5001 or consent of instructor.* Supervised study of specialized topic or research project.

COM 6910—Supervised Research (1-5; max: 5) *Prereq: COM 5001 or 6300, and instructor's approval.* S/U.

COM 6930—Special Topics (3; max: 9) *Prereq: consent of instructor.* Theory and research in communication.

COM 6932—Directed Readings in Symbolic Interactionist Theory (3) *Prereq: COM 5001 and 6400 and consent of instructor.* Major symbolic interactionist theorists and their contributions to the communication field.

COM 6934—Directed Readings in Humanistic Theory (3) *Prereq: COM 5001 and 6400 and consent of instructor.* Major humanistic theorists and their contributions to the communication field.

COM 6936—Directed Readings in Systems Theory (3) *Prereq: COM 5001 and 6400 and consent of instructor.* Major systems theorists and their contributions to the communication field.

COM 6941—Internship in Communication (1-3; max: 3) *Prereq or coreq: COM 5001 or equivalent.* Supervised field experience. S/U.

COM 6971—Research for Master's Thesis (1-15) S/U.

COM 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.

COM 7980—Research for Doctoral Dissertation (1-15) S/U.

LIN 5716—Language Sampling and Grammatical Analysis (3) *Prereq: consent of instructor.* Advanced consideration of grammatical development and analysis in children beginning with two-word utterance stage through complex grammatical stage. Grammatical analysis of children's speech at different stages of language development.

LIN 6339—Seminar: Applied Phonology (3) *Prereq: SPA 5202.* Phonological theory in speech-language pathology, audiology, and speech science.

LIN 6751—Seminar in Language and Literacy (3) *Prereq: LIN 3010 or consent of instructor.* Consideration of the role of literacy in language acquisition and cognitive development.

LIN 7295—Seminar in Experimental Phonetics (2) Advanced research problems in production of voice or speech.

LIN 7709—Seminar in Neurolinguistics (3) Selected problems in linguistic theory and research, with emphasis on experimental analysis.

SPA 5015—Speech Acoustics (2) The vocal tract as a resonating system and the acoustic signal as it affects perception.

SPA 5106—Neurophysiology of Hearing (3; max: 6) *Prereq: SPA 3032.* Neuroanatomy of the auditory system, peripheral and central dynamics of the cochlea, electrophysiological response in the cochlea and in various levels of the auditory system.

SPA 5108—Speech Physiology (2) *Prereq: SPA 3011 and 3101.* The anatomy, physiology, and neurophysiology of the speaking mechanism.

SPA 5136C—Experimental Audiology (4) Concepts relevant to audiometric evaluation and methods used in developing audiological procedures. Electroacoustical instrumentation and calibration.

SPA 5204—Phonological Disorders (3) Advanced principles of diagnosis and remediation.

SPA 5211—Voice Disorders (3) Advanced theory and techniques of diagnosis and remediation.

SPA 5225—Principles of Speech Pathology: Stuttering (3) Advanced theories and techniques of diagnosis and therapy.

SPA 5245—Communicative Disorders Related to Cleft Palate (3) *Prereq: SPA 5202, 5211, 5403.* Lectures and laboratory study of the "team approach" and interdisciplinary aspects of communicative disorders in the cleft palate individual.

SPA 5304—Principles of Audiological Evaluation (3) Advanced procedures in speech audiometry, masking, and audiogram interpretation.

SPA 5386—Manual Communication with the Hearing Impaired (2) Overview of the various types of signing systems, including ASL, Signed English, and SEE. Emphasis placed on teaching manual communication skills that will be most useful in a professional speech and hearing setting.

SPA 5403—Language Disorders I (3) Advanced theory and techniques of diagnosis and remediation of language disorders in infants and preschoolers.

SPA 5405—Language Disorders II (3) Detailed examination of language intervention programs and nonvocal communication systems.

SPA 5423—Speech and Language for the Deaf and Hard-of-Hearing (3) *Prereq: SPA 5304 or consent of instructor.* Advanced principles and procedures in the development and correction of speech and language of the deaf and hard-of-hearing.

SPA 5553L—Lab I: Principles of Diagnosis and Appraisal in Speech Pathology and Audiology (1) Advanced analysis of interviewing principles, examination procedures, standardized testing, and clinical assessment techniques.

SPA 5554L—Lab II: Principles of Counseling and Supervision in Speech Pathology and Audiology (1) Lectures; discussion, and lab in clinical supervision and counseling in communicative disorders.

SPA 5933—Seminar: Professional Aspects of Audiology (2) Federal and state regulations, audiologic jurisprudence, audiological management, and interfacing with other professionals.

SPA 6133L—Hearing Aid Analysis Laboratory (1) *Coreq: SPA 6345.* Advanced analysis and description of electroacoustical properties of hearing aids.

SPA 6140—Experimental Phonetics: Laryngeal Function (3) Principles involved in acoustical and physiological analyses of voice production and laryngeal function. Major theories, experimental procedures, and research findings.

SPA 6141—Experimental Phonetics: Speech Physiology (3) *Prereq: SPA 6140.* Laboratory experience in experimental methods and techniques for study of voice production and analysis of voice signals.

SPA 6216—Seminar in Special Voice Problems (2; max: 6) *Prereq: SPA 5211.*

SPA 6227—Seminar: Childhood Stuttering (2)

SPA 6233—Seminar in Neuromotor Speech Disorders (3) Consideration of both development and acquired neurogenic speech disorders and their associated neuropathology, etiology, characteristics, assessment practices, and treatment strategies.

SPA 6305—Pediatric Audiology (2) *Prereq: SPA 6313.*

SPA 6313—Peripheral Disorders of Hearing (3) *Prereq: SPA 5304.* Techniques for assessment of peripheral auditory disorders. Medical contributions to hearing loss and test interpretation.

SPA 6314—Assessment of Central Auditory and Vestibular Nervous System (3) Theoretical and experimental literature and procedures for differential diagnosis of central auditory and vestibular disorders.

SPA 6327—Seminar in Aural Rehabilitation and Psychology of Deafness (3) Theoretical and clinical literature.

SPA 6345—Seminar in Audiology: Hearing Aids (3) *Prereq: SPA 6313; coreq: SPA 6133L.*

SPA 6410—Adult Neurolinguistic Pathologies (3) Nature of acquired aphasia and related disorders, neuropsychological and neurolinguistic models of aphasia and related disorders. Emphasis on methods of assessment and treatment of these disorders.

SPA 6411—Childhood Aphasia and Autism (2) *Prereq: SPA 5403, 5405.* A review of developmental and neurological aspects, with emphasis on evaluation and treatment.

SPA 6412—Nonvocal Communication (2) *Prereq: SPA 5403, 5405.* Clinical issues in the application of nonvocal communication systems.

SPA 6521—Clinical Practice in Speech Pathology: Diagnosis (1-6; max: 6) *Prereq: SPA 5553L.* S/U.

SPA 6524—Clinical Practice in Speech Pathology: Therapy (1-10; max: 10) S/U.

SPA 6531—Clinical Practice in Hearing Measurement (1-6; max: 6) S/U.

SPA 6533—Clinical Practice in Aural Rehabilitation (1-6; max: 6) *Prereq: SPA 5423, 5322.* S/U.

SPA 6600—Organization and Administration of Speech Pathology and Audiology Programs (3) Administrative problems and practices in varied speech pathology and audiology settings, community clinics, hospitals, schools, universities, training centers, and private practice.
SPA 6930—Proseminar in Speech-Language Pathology and Audiology (1; max: 6) Faculty and graduate student research in speech-language pathology, audiology, and related disciplines. S/U.
SPA 6938—Seminar: Interdisciplinary Topic in Hearing (3) Current readings in medical disorders of hearing, maturational processes, and auditory perception of speech.
SPA 6940—Supervised Teaching (1-5; max: 5) S/U.
SPA 6971—Research for Master's Thesis (1-15) S/U.
SPA 7127—Experimental Phonetics: Speaker Recognition (3) Experimental research problems in speech recognition, speaker identification, speech analysis, and synthesis. Emphasis on vocodors, synthesizers, machine translation, and computer processing of speech.
SPA 7354—Seminar in Audiology: Hearing Conservation and Noise Control (3)
SPA 7500—Public School Practicum (1-3; max: 10) *Prereq: majority of preprofessional courses.* Experience in partial fulfillment of department's clinical requirements. S/U.
SPA 7523—Practicum in Speech Pathology in a Medical-Dental Setting (1-6; max: 6) *Prereq: SPA 6521, 6524, and consent of department.* S/U.
SPA 7536—Practicum in Audiology in a Medical Setting (1-6; max: 6) *Prereq: SPA 6531 and consent of department.* S/U.
SPA 7809—Single Subject Experimental Research in Communication Disorders (3) Use of single-subject experimental research design for investigating efficacy of treatment and for examining theoretical models of communication. Emphasis on conceptualization of appropriate experimental questions, design, and technical aspects of this approach.
SPC 6335—Seminar in Nonverbal Communication (3) *Coreq: COM 5001 or equivalent.* Advanced theory and research in nonverbal communication.
SPC 6391—Seminar in Interpersonal Communication (3) *Coreq: COM 5001 or consent of instructor.* In-depth study of interpersonal communication and theory.
SPC 6442—Seminar in Small Group Communication (3) *Prereq or coreq: COM 5001 or equivalent.* In-depth study of small group communication theory and research.

COMMUNICATIVE DISORDERS
Colleges of Health Related Professions and Liberal Arts and Sciences

GRADUATE FACULTY 1993-94

Chairman & Graduate Coordinator: K. R. Bzoch. *Professors:* K. R. Bzoch; M. Crary; F. J. Kemker. *Associate Professors:* A. E. Holmes; W. N. Williams. *Assistant Professor:* J. C. Sutter.

The Department of Communicative Disorders is primarily responsible for interdisciplinary clinical teaching and research for the Colleges of Health Related Professions, Medicine, Dentistry, and Nursing in aspects of speech pathology and audiology related to the professional degree programs of these colleges.

Courses and degrees with concentrations in speech pathology and audiology are offered by the Department of Communication Processes and Disorders in the College of Liberal Arts and Sciences. The descriptive listings of courses in speech pathology and audiology may be found under Department of Communication Processes and Disorders in the *Undergraduate* and *Graduate Catalogs*. The following courses are customarily taught by faculty of the College of Health Related Professions who also hold appointments in the Department of Communication Processes and Disorders. For admission information, contact the appropriate graduate coordinator in the Department of Communication Processes and Disorders, 336 Dauer Hall.

GMS 7751C—Central Auditory Function and Dysfunction (3-5) *Prereq: GMS 7706C or consent of instructor.* Overview of normal brainstem and cortical function provides background for discussion of physiological, audiometric, and neurophysiological studies of central auditory impairments.
HSC 6905—Individual Study in Health Related Professions (4; max: 12)
SPA 5242—Communicative Disorders Related to Cleft Lip and Palate (3) *Prereq: SPA 5202, 5211, 5403.* Lectures, discussions and laboratory study of the —team approach— and interdisciplinary aspects of correcting communicative disorders in the cleft palate individual.
SPA 6208—Seminar in Cerebral Palsy and Neurogenic Articulation Disorders (3)
SPA 6245L—Lab: Cleft Palate (1)
SPA 6313—Peripheral Disorders of Hearing (4) *Prereq: SPA 5304.* Techniques for the assessment of peripheral auditory disorders. Medical contributions to hearing loss and test interpretation.
SPA 6345—Seminar in Audiology: Hearing Aids (3) *Prereq: SPA 6313; coreq: SPA 6133.*
SPA 6410—Seminar in Neurogenic Communication Disorders (2)
SPA 6938—Seminar: Interdisciplinary Topic in Hearing (3) Current readings in medical disorders of hearing, maturational processes, and auditory perceptions of speech.
SPA 7523—Practicum in Speech Pathology in a Medical-Dental Setting (1-6; max: 6)
SPA 7536—Practicum in Audiology in a Medical Setting (1-6; max: 6)

COMPUTER AND INFORMATION SCIENCES
Colleges of Business Administration, Engineering, and Liberal Arts and Sciences

GRADUATE FACULTY 1993-94

Chairman: S. S. Yau. *Graduate Coordinator:* Y. H. Lee. *Professors:* Y. C. Chow; G. E. Nevill, Jr.; G. X. Ritter; S. Sahni; R. G. Selfridge; J. Staudhammer; S. Y. W. Su; F. J. Taylor; D. C. Wilson; S. S. Yau. *Associate Professors:* M. E. Bermudez; U. S. Chakravarthy; P. A. Fishwick; H. A. Latchman; Y. H. Lee; B. C. Vemuri. *Assistant Professors:* D. D. Dankel; T. A. Davis; L. M. Fu; E. N. Hanson; T. J. Johnson; N. N. Kamel; A. F. Laine; H. Lam; P. Livadas; R. E. Newman-Wolfe; S. M. Thebaut; J. N. Wilson.

The Department of Computer and Information Sciences offers the Master of Engineering, Engineer, and Ph.D. degrees through the College of Engineering, and a Master of Science degree through any one of three colleges—Business Administration, Engineering, and Liberal Arts and Sciences.

Areas of specialization within the program in computer and information sciences cover a wide range including programming languages, database management, software engineering, computer graphics, computer vision, business information systems, operating systems, compilers, performance measurement, artificial intelligence, architecture, simulation, parallel processing, distributed computing, computer communication, and theory of computation.

Applications for admission must be approved by both the Department and the college in which the student wishes to enroll. Applicants should have a strong computer science background.

Students who wish to obtain a degree from a college other than the one from which they received their undergraduate degrees and students with inadequate backgrounds in mathematics and statistics will be required to do additional remedial work specified by the Department's Graduate Coordinator and approved by the new college. The remedial work will generally include core requirements for the new college.

All master's students must satisfy a core requirement by completing four specified graduate level courses (12 credits) or their approved equivalents. Students must maintain an average of at least 3.0 on the core courses with no more than one of the courses receiving a letter grade of C or C+. A grade of D or below in any core course will necessitate retaking that course.

Students can select a thesis or nonthesis option for the master's degree. The thesis option requires a minimum of 30 credit hours and the nonthesis option a minimum of 33 credit hours. The thesis degree requires an additional 12 credits of course work beyond the core (graduate level credits in CIS and at most six credits in some other department in the student's college), and a written thesis. A minimum of six credit hours must be taken in CIS 6971. The nonthesis option requires an additional 15 letter-graded credits of course work in CIS beyond the core and at most 6 letter-graded credits in some other department in the student's college. Each nonthesis master's student is required to pass a comprehensive examination administered by the supervisory committee.

Ph.D. students are required to take a minimum of 90 credit hours. Of these, at least 42 hours must be graduate level CIS course work. A minimum of 15 hours must be taken in CIS 7980. A maximum of 30 credits may be awarded toward the Ph.D. degree from an appropriate master's degree.

All students must form a supervisory committee by the end of their second semester of enrollment.

The Database Systems Research and Development Center, the Software Engineering Research Center, the Center for Computer Vision and Visualization Center, and a number of other campus research centers provide opportunities for students enrolled in the program.

CAP 5705—Computer Graphics (3) *Prereq: COP 3530.* Display device characteristics; system considerations, display algorithms. Curve and surface generation. Lighting models and image rendering.

CAP 6610—Machine Learning (3) *Prereq: CAP 6635.* Review of attempts, within the artificial intelligence community, to construct computer programs that learn. Statistical pattern recognition with its applications to such areas as optical character recognition. Inductive learning, automated discovery.

CAP 6615—Neural Networks for Computing (3) *Prereq: CAP 6635.* Neural network models and algorithms. Adaptive behavior, associative learning, competitive dynamics and biological mechanisms. Applications include computer vision, cognitive information processing, control, and signal analysis.

CAP 6627—Expert Systems (3) *Prereq: CAP 6635.* Production systems, meta-knowledge, heuristic discovery, indepth examination of several expert systems including TEIRESIAS, AM, DENDRAL, MYCIN, IRIS, CASNET, INTERNIST, BACON, PROSPECTOR.

CAP 6635—Artificial Intelligence Concepts (3) *Prereq: COC 3110, COP 3530 or equivalent.* Heuristic search, game theory, knowledge representation, logic, machine learning, AI languages and tools. Applications such as planning, natural language understanding, expert systems, and computer vision.

CAP 6640—Natural Language Processing (3) *Prereq: CAP 6635.* Transformational grammars, syntactic and semantic parsing; context, context recognition, conceptual analyzers; metaphors, reminding and memory organization, procedural semantics; natural language access to databases.

CAP 6651—Knowledge Representation (3) *Prereq: CAP 6635.* Techniques used within the field of artificial intelligence. Various forms of logic including predicate, first order, and non-monotonic; procedural representations; semantic networks; production systems, direct representations; frames; and scripts.

CAP 6657—Computers and Vision I (3) *Prereq: CAP 6635 or consent of instructor.* Examination of attempts to replicate human visual abilities with computer programs. Visual perception, image formation, early processing, image algebra, and basic segmentation techniques.

CAP 6659—Computers and Vision II (3) *Prereq: CAP 6657.* Image understanding systems, medical and industrial applications of computer vision techniques, and computer architectures for image processing and image analysis.

CDA 5155—Computer Architecture Principles (3) *Prereq: CDA 3101, COP 3530, and 4600.* Fundamental design issues of processor and computer architecture, a variety of design approaches for CPU, memory and system structure.

CDA 6130—Comparative Computer Architecture (3) *Prereq: COP 4600, EEL 3701.* Computer architecture in terms of classic concepts, single and multiprocessors, networks, fault tolerance, and technology.

CDA 6141—Fault-Tolerant Computing (3) *Prereq: COP 5622 and CDA 5155.* Fundamental concepts of reliability, redundancy, and error recovery. Algorithms and designs for fault-tolerant architecture, reliable communication, and distributed processing systems.

CDA 6159—High Performance Computer Architecture (3) *Prereq: CDA 5155, COP 5622.* Design and evaluation of instruction-level (superscalar, superpipeline) and task-level (fine and coarse-grained) parallel architecture. Language and operating system support instruction and task scheduling, task synchronization.

CDA 6501—Computer Communication Networks (3) *Prereq: COP 5622 and 5533.* Computer network architecture, including topologies, media, switching, routing, congestion control, protocols, and case studies.

CEN 6070—Software Testing and Verification (3) *Prereq: COP 5630.* Concepts, principles, and methods for software testing and verification. Topics include human and machine based testing strategies, formal proofs of correctness, and software reliability.

CEN 6075—Software Specification (3) *Prereq: COP 5630.* Concepts, principles, and methods for practical software specification. System modeling, requirements exploration, validation and prototyping, and documentation techniques.

CEN 6081—Software Engineering for Parallel and Distributed Systems (3) *Prereq: COP 5630.* Characteristics of software for parallel processing and distributed computing systems as well as embedded systems. Development and maintenance methodologies for such software systems.

CEN 6082—Software Maintenance and Reuse (3) *Prereq: COP 5630.* Concepts, principles, and techniques for software maintenance and reuse. Using software reuse technologies to improve software development productivity and quality as well as to facilitate software maintenance.

CIS 6120—Database Management Systems (3) *Prereq: COP 3530, 4600, or equivalent.* An introduction to systems and procedures for managing large computerized databases.

CIS 6123—Database Design and Implementation (3) *Prereq: CIS 6120; a working knowledge of database system architecture, data models, sublanguages, storage structures and access techniques, file organizations, and access methods.* Systematic, integrated database design and implementation including corporate requirement analysis, semantic modeling, view integration, data mapping to DBMS schema and subschema, physical database design and evaluation, and database restructuring and conversion. Term project.

CIS 6124—Database Theory (3) *Prereq: CIS 6120, COT 6325.* Database theory including the underlying mathematical tools and the connection between theory and practice.

CIS 6125—Distributed Database Systems (3) *Prereq: CIS 6120, COP 5622, and a course in computer networks.* Distributed database systems including the areas of distributed database design, resource allocation, access plan selection, and transaction management.

CIS 6905—Individual Study (1-3; max: 6) *Prereq: consent of faculty member supervising the study.* S/U option.

CIS 6910—Supervised Research (1-5; max: 5) *Prereq: graduate status in CIS.* S/U.

CIS 6930—Special Topics in CIS (1-3; max: 9) *Prereq: vary depending on topics.*

CIS 6940—Supervised Teaching (1-5; max: 5) *Prereq: graduate status in CIS.* S/U.

CIS 6971—Research for Master's Thesis (1-15) S/U.

CIS 6972—Research for Engineer's Thesis (1-15) S/U.

CIS 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.

CIS 7980—Research for Doctoral Dissertation (1-15) S/U.

COP 5305—Computer Simulation Concepts (3) *Prereq: COP 3530.* Introduction to concepts in continuous and discrete simulation. Empasis on fundamental concepts and methodology, using practical examples from a wide variety of disciplines.

COP 5333—Object-Oriented Programming Languages (3) *Prereq: COP 5550 or consent of instructor.* Concepts include objects, message passing, high-level data abstraction, classes, dynamic binding, and inheritance. Examination of semantics, implementation, and design methodologies of representative languages.

COP 5533—Advanced Data Structures (3) *Prereq: COP 3530.* Development of efficient data structures used to obtain more efficient solutions to classical problems, such as those based on graph theoretical model, as well as problems that arise in application areas of contemporary interest.

COP 5550—Programming Language Principles (3) *Prereq: COP 3530.* History of programming languages, formal models for specifying languages, design goals, run-time structures, and implementation techniques, along with survey of principal programming language paradigms.

COP 5622—Operating System Principles (3) *Prereq: COP 4600.* The concepts and techniques of efficient management of computer system resources.

COP 5630—Software Engineering (3) *Prereq: COP 3212 and 3603.* Topics in projects organization, specification techniques, reliability measurement, documentation.

COP 5641—Programming Language Translators I (3) *Prereq: COP 5550.* Anatomy of translators for high-level programming languages.

COP 6306—Advanced Concepts in Computer Simulation (3) *Prereq: COP 5305.* Elements of simulation modeling and analysis. Discrete and continuous simulation methodology. Incorporation of computer animation and physically based modeling techniques.

COP 6509—Advanced Topics in Programming Languages (3; max: 6) *Prereq: COP 5641 or consent of instructor.*

COP 6617—Distributed Operating Systems (3) *Prereq: COP 5622; coreq: COT 5305.* Concepts central to providing operating systems services over a network of computers. Case studies—Worms, LOCUS, DUNIX, Mach, SODA, GDOS, Chrysallis.

COP 6621—Programming Language Translators II (3) *Prereq: COP 5641.* State-of-the-art issues in construction of translators for high-level programming languages.

COT 5305—Analysis of Algorithms (3) *Prereq: COP 3530 or equivalent.* Introduction and illustration of basic techniques for designing efficient algorithms and analyzing algorithm complexity.

COT 6325—Formal Languages and Computation Theory (3) *Prereq: COP 3530 and familiarity with discrete mathematics and data structures.* Introduction to theoretical computer science including formal languages, automata theory, turing machines and computability.

COT 6410—Computational Complexity (3) Topics in complexity theory, complexity classes, reductions, completeness, oracle computations, structure of complexity classes.

COT 6435—Parallel Algorithms—Design and Analysis (3) *Prereq: COT 5305 and COP 5622.* Introduction to models of parallel computation including communication mechanisms and complexity measures; investigation of algorithms on shared memory and message-passing models.

CRM 6201—Computer System Measurement and Evaluation (3) *Prereq: COP 5622 and basic course in probability and statistics.* Computer measurement tools and techniques, analytical techniques for computer system modeling and evaluation, simulation techniques, performance measurement and evaluation in performance improvement problems, and performance evaluation in computer comparison and selection problems.

COUNSELOR EDUCATION
College of Education

GRADUATE FACULTY 1993-94

Interim Chairperson: P. J. Wittmer. *Graduate Coordinator:* L. C. Loesch. *Distinguished Service Professor:* P. J. Wittmer. *Professors:* E. S. Amatea; J. A. Archer; R. J. Drummond;* G. M. Gonzalez; J. J. Larsen *(Emeritus)*; L. C. Loesch; J. I. Morgan; R. D. Myrick; W. M. Parker; J. L. Resnick; H. C. Riker *(Emeritus)*; J. P. Saxon; P. G. Schauble. *Associate Professors:* R. M. Bollet;† T. Carter;* M. Fukuyama; J. Joiner; J. H. Lombana;* M. J. McMillin; P. M. Meek; P. A. D. Sherrard. *Assistant Professors:* M. F. Howard-Hamilton; J. H. Pitts.

These members of the faculty of the University of North Florida (*) and the University of Central Florida (†) are also members of the graduate faculty of the University of Florida and participate in doctoral programs in the University of Florida Department of Counselor Education.

Programs leading to the Master of Education, Specialist in Education, Doctor of Education, and Doctor of Philosophy degrees are offered through this department. In some programs, the Master of Education degree (identified below by an asterisk) is awarded only upon completion of the Specialist in Education degree; however, course work toward the Specialist in Education degree completed after 60 semester hours is considered post-master's level work. Program areas include (1) school counseling and guidance (M.Ed.,* Ed.S., Ed.D., or Ph.D.) for positions in elementary, middle, and secondary schools; (2) student personnel in higher education (M.Ed., Ed.S., Ed.D., or Ph.D.) for positions in community colleges, vocational-technical schools, colleges, universities, and other post-secondary school settings; (3) agency, correctional, and developmental counseling (M.Ed.,* Ed.S., Ed.D., or Ph.D.); and (4) counselor education (Ed.D. or Ph.D.).

The school counseling and guidance; student personnel in higher education; agency, correctional, and developmental counseling; and counselor education programs are accredited by the Council for the Accreditation of Counseling and Related Educational Programs.

Marital, family, health, multicultural, or substance abuse counseling is a possible emphasis in various program areas listed above. A subspecialization in rehabilitation counseling is offered in the agency, correctional, and developmental counseling doctoral program. Career development and research are integral parts of preparation in all programs.

Candidates for admission are urged to complete a course in basic statistics before entering a program. Otherwise, these requirements must be met before completion of 30 semester hours of program applicable credits.

EGC 6005—Introduction to Counseling (3) *Prereq or coreq: EGC 6410 and 6416.*
EGC 6045—Counseling with Children (3) *Prereq: EGC 6416.*
EGC 6047—Counseling Adolescents (3) *Prereq: EGC 6005, 6416.*
EGC 6054—Problems in Personnel Work (2-7; max: 7) Seminar in special problems in counseling and development.
EGC 6055—Student Personnel Services in Higher Education (3) *Prereq: EGC 6005, 6057.*
EGC 6057—The College Community and the Student (3) *Prereq or coreq: EGC 6005.*
EGC 6225—Assessment in Counseling and Development (3) *Prereq: course in basic statistics.*
EGC 6241—Diagnosis and Treatment of Mental Disorders (3) *Prereq: EGC 6410, 6416.*
EGC 6317—Career Development (3)
EGC 6410—Personality and Mental Health Counseling (3) *Coreq: EGC 6005 and 6416.*
EGC 6412—Sexuality and Mental Health (3) *Prereq: EGC 6410, 6416.*
EGC 6414—Introduction to Family Counseling (3) *Prereq: EGC 6416 and 3 credits of EGC 7446.*
EGC 6416—Counseling Theories and Applications (4) *Prereq: EGC 6005; coreq: EGC 6410.*
EGC 6418—Marriage Counseling (3)
EGC 6419—Professional, Ethical, and Legal Issues in Marriage and Family Counseling (3)
EGC 6426—Counseling in Community Settings (3) *Prereq: EGC 7446; coreq: current enrollment in a community agency practicum or internship.*
EGC 6430—Developmental Counseling Over the Lifespan (3)
EGC 6438—Play Counseling and Play Process with Children (3) *Prereq: EGC 6416.*
EGC 6461—Substance Abuse Counseling (3)
EGC 6463—Multicultural Counseling (3) *Prereq: EGC 6410.*
EGC 6465—Counseling for Mid-Life and Pre-Retirement (3)
EGC 6466—Counseling Needs of Older Persons (3)
EGC 6467—Counseling Older Persons: Theories and Techniques (3) *Prereq: EGC 6410.*
EGC 6469—Counseling in a Global Community (3)
EGC 6505—Group Counseling: Theories and Process (3) *Prereq: EGC 6410.*
EGC 6606—Organization and Administration of Guidance and Personnel Programs (3) *Prereq: EGC 6045.*
EGC 6840—Practicum I in Student Development (3) *Prereq: EGC 6005, permission of adviser, and written application to practicum coordinator at least six weeks in advance of registration.* S/U.
EGC 6905—Individual Work (2-4; max: 12) *Prereq: consent of staff members and graduate coordinator; approval of proposed project.*
EGC 6910—Supervised Research (1-5; max: 5) S/U.
EGC 6933—Professional Identity and Ethics in Counseling (2)
EGC 6938—Special Topics (1-4; max: 12) *Prereq: consent of department chairperson.*
EGC 6940—Supervised Teaching (1-5; max: 5) S/U.
EGC 7056—Seminar in Higher Education Student Personnel (1-2; max: 4) *Prereq: EGC 6055, 6057.*
EGC 7415—Advanced Family Counseling (4) *Prereq: EGC 6414.*
EGC 7446—Practicum I in Counseling—150 Hours (3) *Prereq: EGC 6416 and written application to the practicum coordinator at least six weeks in advance of registration.* S/U.
EGC 7451L—Practicum II in Agency Counseling (3) *Prereq: EGC 7446, permission of adviser, and written application to practicum coordinator at least six weeks in advance of registration. Coreq: EGC 7456.* S/U.
EGC 7452L—Practicum II in Marriage and Family Counseling (3) *Prereq: EGC 7446, permission of adviser, and written application to practicum coordinator at least six weeks in advance of registration. Coreq: EGC 7457.* S/U.
EGC 7453L—Practicum II in School Counseling (3) *Prereq: EGC 7446, permission of adviser, and written application to practicum coordinator at least six weeks in advance of registration. Coreq: EGC 7458.* S/U.
EGC 7454L—Practicum II in Student Development (3) *Prereq: EGC 6840 or 7446, permission of adviser, and written application to practicum coordinator at least six weeks in advance of registration. Coreq: EGC 7459.* S/U.
EGC 7455C—Practicum in Counseling Supervision (4; max: 8) *Prereq: EGC 6416, permission of adviser, and written application to practicum coordinator at least six weeks in advance of registration. Open only to advanced doctoral students.* S/U.
EGC 7456L—Group Supervision in Agency Counseling (1; max: 5) *Prereq: written application to practicum/internship coordinator at least six weeks in advance of registration. Coreq: EGC 7446, 7451, 7890, or 7892.* S/U.
EGC 7457L—Group Supervision in Marriage and Family Counseling (1; max: 5) *Prereq: written application to practicum/internship coordinator at least six weeks in advance of registration. Coreq: EGC 7446, 7452, 7890, or 7892.* S/U.
EGC 7458L—Group Supervision in School Counseling (1; max: 5) *Prereq: written application to practicum/internship coordinator at least six weeks in advance of registration. Coreq: EGC 7446, 7453, 7890, or 7892.* S/U.
EGC 7459L—Group Supervision in Student Development (1; max: 5) *Prereq: written application to practicum/intership coordinator at least six weeks in advance of registration. Coreq: EGC 6840, 7446, 7459, 7890, or 7822.* S/U.
EGC 7485—Seminar in Counseling Research (2) *Prereq: admission to candidacy for the doctorate in counselor education.*
EGC 7616—Research in Counseling and Development (3) *Prereq: EGC 6225 or equivalent and course in basic statistics.*
EGC 7706—Consultation Procedures (3) *Prereq: EGC 7446; coreq: registration in practicum or internship.*
EGC 7825L—Practicum in Counseling Supervision (4; max: 8) *Prereq: EGC 6416, permission of adviser, and written application to practicum coordinator at least six weeks in advance of registration. Open only to advanced doctoral students.* S/U.
EGC 7890—Internship in Counseling and Development—600 Hours (5; max: 15) *Prereq: permission of adviser, completion of all practica required for the M.Ed. or Ed.S. degree and written application to the internship coordinator at least six weeks in advance of registration.* S/U.
EGC 7892L—Supervision for a Split Internship (3; max: 6) *Prereq: permission of adviser, completion of practicum sequence and written application to internship coordinator at least six weeks in advance of registration. Coreq: EGC 7456, 7457, 7458, or 7459.* Required first enrollment for students participating in internship over two semesters. S/U.
EGC 7894C—Internship in Counselor Education (6; max: 12) *Prereq: EGC 6416, 6447, and written application to internship coordinator at least six weeks in advance of registration. Open only to advanced doctoral students.* S/U.
EGC 7897—Internship in Agency Program Management (6) *Prereq: EGC 6416, 6447, and written application to internship coordinator at least six weeks in advance of registration. Open only to advanced doctoral students.* S/U.
EGC 7979—Advanced Research (1-9) *Research for doctoral students before admission to candidacy.* Designed for students with a master's degree in the field of study or for students who have been admitted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.
EGC 7980—Research for Doctoral Dissertation (1-15) S/U.

DAIRY SCIENCE
College of Agriculture

GRADUATE FACULTY 1993-94

Chairman: R. P. Natzke. *Graduate Coordinator:* H. H. Head. *Graduate Research Professor:* W. W. Thatcher. *Professors:* D. K. Beede; P. J. Hansen; B. Harris, Jr.; H. H Head; R. P. Natzke; H. H. Van Horn, Jr.; D. W. Webb; C. J. Wilcox. *Associate Professors:* K. C. Bachman; M. A. De Lorenzo; F. A. Simmen; C. R. Staples.

The Dairy Science Department offers the Master of Science and Master of Agriculture degrees (specialization in dairy production). The Doctor of Philosophy degree (specialization in animal physiology, nutrition, and genetics) is available through the Department of Animal Science.

Areas of interest include quantitative genetics, nutrition, reproductive, environmental, and lactational physiology, endocrinology, biochemistry, biotechnology, mastitis, and management sciences.

A departmental prerequisite for admission to graduate study in dairy science is a strong undergraduate background in the physical or biological sciences. A prospective graduate student need not have majored in dairy science as an undergraduate.

The following courses in related areas will be acceptable for graduate credit as part of the candidate's major: ASG 5221—Animal Production in the Tropics; ANS 5446—Animal Nutrition; ANS 6368—Quantitative Genetics; ANS 6448—Nitrogen and Energy in Animal Nutrition; ANS 6452—Principles of Forage Quality Evaluation; ANS 6458—Advanced Methods in Nutrition Technology; ANS 6472—Vitamins; ANS 6715—The Rumen and Its Microbes; ANS 6723—Mineral Nutrition and Metabolism; ANS 6751—Physiology of Reproduction; VME 5242C— Physiology of Body Fluids; VME 5244—Physiology of Mammals: Organ Systems.

DAS 6281—Dairy Science Research Techniques (3) *Prereq: STA 6167.* Methods employed in research in specialized dairy fields; genetics, nutrition, and physiology.
DAS 6322—Introduction to Statistical Genetics (2) *Prereq: ANS 6368, STA 6167.* Development and application of statistical and quantitative genetics theory to selection and estimation of genetic parameters.
DAS 6512C—Advanced Physiology of Lactation (2) *Prereq: VME 5242C.*
DAS 6531—Endocrinology (4) *Prereq: BCH 4024; VME 5242C.*
DAS 6541—Energy Metabolism (3) *Prereq: ANS 5446; BCH 4024; HUN 3246, permission of instructor.*
DAS 6555—Environmental Physiology of Domestic Animals (3) *Prereq: VME 5242C.*
DAS 6905—Problems in Dairy Science (1-3; max: 4) H.
DAS 6910—Supervised Research (1-5; max: 5) S/U.
DAS 6931—Graduate Seminar in Dairy Science (1; max: 6)
DAS 6940—Supervised Teaching (1-5; max: 5) S/U.
DAS 6971—Research for Master's Thesis (1-15) S/U.

DECISION AND INFORMATION SCIENCES
College of Business Administration

GRADUATE FACULTY 1993-94

Chairman: S. S. Erenguc. *Graduate Coordinator:* A. Majthay. *Graduate Research Professor:* I. Horowitz. *Professors:* H. P. Benson; R. A. Elnicki; S. S. Erenguc; G. J. Koehler. *Associate Professor:* A. Majthay. *Assistant Professors:* S. Piramuthu; P. A. Thompson.

The Decision and Information Sciences Department offers graduate work leading to the Master of Arts (M.A.) and the Ph.D. in business administration, as well as a concentration in the Master of Business Administration (MBA) program. The primary areas of concentration in both the M.A. and the Ph.D. programs are decision sciences, information systems and production, and operations management.

The Ph.D. curriculum includes course work in four areas: breadth, research foundations, the major field, and electives.

The breadth requirement applies only to students entering without prior course work in business administration. Students who do not meet the requirement by virtue of their undergraduate or graduate programs before beginning the Ph.D. program must take at least three graduate courses in functional areas in the College of Business Administration, outside their major area. These courses will be approved by the student's supervisory committee.

The research foundations requirements for students in decision sciences and production and operations management are as follows: STA 4321—Mathematical Statistics I and either STA 4322—Mathematical Statistics II or STA 6167—Statistical Methods in Research II; QMB 6827—Linear Programming for Management Scientists or ESI 6417—Linear Programming and Network Optimization; QMB 6607—Decision Processes Under Uncertainty; MAN 6511—Production Management Problems; ESI 6429—Introduction to Nonlinear and Dynamic Programming.

The research foundation requirements for students in information systems are as follows: STA 4322 or STA 6167 and STA 6707—Analysis of Multivariate Data; QMB 6607; QMB 6827 or ESI 6417; QMB 6877—Integer Programming and Network Flows; COT 5305—Analysis of Algorithms. In some cases, students may substitute more advanced courses for the courses listed under the research foundation requirements.

The major field course work is made up of a set of at least four graduate courses and/or seminars plus other work specified by the student's supervisory committee. In addition, the student is required to attend the DIS Workshop series, which features presentations by both University of Florida faculty and students and researchers from other institutions. Electives are selected from advanced DIS seminars and other related disciplines. There is no minor requirement.

The M.A. curriculum is designed primarily as a "feeder" to the Ph.D. program. Students take the same course work as Ph.D. students, with the exception that they are required to take fewer electives and courses in the major field. Students may select a nonthesis option, substituting two advanced DIS seminars/courses for the thesis. The normal time for completion of the M.A. program is two years.

CAP 5021—Computer-Based Business Management (3) *Prereq: CSG 3460 or consent of instructor.* Principles of data-processing management and the application of computers in solving business problems.
ISM 5021—Information Systems In Organizations (3) *Prereq: consent of instructor.* Introduction for graduate students with minimal microcomputer operation skills. Topics include the range of computer information technology available, language types and procedural languages, applications in organizations, management of resources, and trends. Students use microcomputers in the College's computing laboratories.
ISM 6222—Business Telecom Strategy and Applications (3) *Prereq: procedural programming language and microcomputer working knowledge.* Use of telecommunication to shape organization strategies. Literature survey of competitive advantage concepts, economics, and legal issues. Industry case studies.

ISM 6423—Knowledge Systems for Business (3) *Prereq: ISM 5021.* Practical issues in wide rage of business situations. Justifying, building, verifying, and using knowledge systems in business. Case studies.

MAN 5501—Operations Management (3) *Prereq: QMB 5305. Designed for MBA candidates.* Purpose of course is to introduce the student to the general class of problems associated with managing production facilities.

MAN 6508—Management of Service Operation (3) *Designed for MBA candidates.* Case studies and problems, including systems design, operation, and control; emphasis on waiting-line systems.

MAN 6511—Production Management Problems (3) Problems in the management of industrial enterprise; management principles and mathematical analysis applied to manufacturing; product development and production; materials and production control; employee relations.

QMB 5305—Introduction to Managerial Statistics (3) *Prereq: basic statistics, calculus. Designed for MBA candidates.* Basic concepts and methods of probability and statistics, stressing applications in analyzing and solving business problems.

QMB 6358—Statistical Analysis for Managerial Decisions (3) *Prereq: QMB 5305. Designed for MBA candidates. Data application techniques* with broad application to managerial problems. Emphasis on difficulties which can arise in the application of the techniques and in the interpretation of results. Experience in use of computerized procedures; may require substantial amount of case analysis.

QMB 6607—Decision Processes Under Uncertainty (3) *Prereq: STA 4322.* Introduction to statistical decision theory, including the vonNeuman-Morgenstern behavioral axioms, forms, techniques for assessing probabilities, and penalty functions, with managerial and economic applications.

QMB 6697—Optimization in Simulation Modeling (3) *Prereq: QMB 5305 or equivalent and possession of appropriate computing skills.* Use of simulation techniques in managerial decision problems, including random number generation and search procedures for determining optimal policies.

QMB 6755—Managerial Quantitative Analysis (3) *Prereq: QMB 5305, MAN 5501, or consent of instructor.* Survey of deterministic models for managerial decision making; emphasis on mathematical programming.

QMB 6808—Markov Decision Processes (3) *Prereq: STA 4321.* Application of Markov processes for managerial decisions, including probability estimation problems and transition reward structures.

QMB 6809—Decision Processes Under Conflict (3) *Prereq: consent of instructor.* Managerial and economic applications of game theory models, including conflict resolution, bargaining, risk sharing, and group decision processes in a managerial context.

QMB 6827—Linear Programming for Management Scientists (3) *Prereq: consent of instructor.* Solving a linear programming model and evaluation of the solution; linear programming computer software and its use.

QMB 6857—Optimization in Static Managerial Models (3) *Prereq: QMB 6827 or equivalent or consent of instructor.* Introduction to the theory and application of unconstrained and constrained optimization in static managerial decision models.

QMB 6865—Optimization in Dynamic Managerial Decision Models (3) *Prereq: QMB 6857.* Introduction to the theory of dynamic optimization in discrete-time and continuous-time models, with managerial and economic applications.

QMB 6877—Integer Programming and Network Flows (3) *Prereq: QMB 6827 or equivalent.* Introduction to the theory of discrete optimization, graphs, and networks. Tools of exact solution methods and of successful heuristic discussed, with managerial and economic applications.

QMB 6905—Individual Work in Decision and Information Sciences (1-5; max: 10) *Prereq: consent of department.* Reading and/or research.

QMB 6910—Supervised Research (1-5; max: 5) S/U.

QMB 6940—Supervised Teaching (1-5; max: 5) S/U.

QMB 6957—International Studies in Quantitative Methods (1-4; max: 12) *Prereq: admission to an approved study abroad program and permission of department.* S/U.

QMB 6971—Research for Master's Thesis (1-15) S/U.

QMB 7931—Special Topics in Decision and Information Sciences (3; max: 9) *Prereq: consent of instructor.* Recent literature and state-of-the-art theory and methods in both the decision and the information sciences.

QMB 7933—Seminar in Decision and Information Sciences (3; max: 9) *Prereq: consent of instructor.* Historical foundations and evolutionary development of concepts in decision and information sciences, emerging problems and future trends.

QMB 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.

QMB 7980—Research for Doctoral Dissertation (1-15) S/U.

ECONOMICS
College of Business Administration

GRADUATE FACULTY 1993-94

Chairman: L. W. Kenny. *Graduate Coordinator:* J. H. Hamilton. *Graduate Research Professors:* G. S. Maddala; W. Woodruff. *American Economic Institutions Free Enterprise Eminent Scholar:* R. F. Lanzillotti. *Jim Walters Eminent Scholar:* T. Lewis. *Florida Public Utilities Professor:* S. V. Berg. *Huber Hurst Professor:* R. D. Blair. *Distinguished Service Professor:* D. Denslow. *Lanzillotti-McKethan Professor:* D. Sappington. *Matherly Professor:* E. Zabel. *Professors:* J. D. Adams; E. Dinopoulos; W. J. Frazer; L. W. Kenny; M. R. Langham; M. M. Lockhart; M. Rush; S. K. Smith; J. R. Vernon; C. A. West. *Associate Professors:* W. A. Bomberger; L. K. Cheng; F. O. Goddard; J. H. Hamilton; A. R. Horowitz; R. E. Romano; S. M. Slutsky; Y. Toda; D. G. Waldo. *Assistant Professor:* D. M. Costello.

The Department offers the Master of Arts (thesis and nonthesis option) and Doctor of Philosophy degrees in economics with specializations in econometrics, economic development, economic theory, industrial organization, international economics, monetary economics, and public finance. The Master of Business Administration degree is also offered with a concentration in economics.

M.A. Requirements.—A minimum of 36 credits of course work is required for both the M.A. with and the M.A. without thesis. A maximum of six credits of research course ECO 6971 may be included for a master's degree with thesis. The following core courses are required: ECO 6805 or equivalent, ECO 5415 or equivalent, ECO 6115, ECO 6206.

Ph.D. Requirements.—Students in the Ph.D. program must complete the following core courses: ECO 5415, 5424, 6115, 6116, 6206, 6207, 6406, and 6805. All core courses must be completed in the first year. In addition, students must complete courses for, and pass qualifying examinations in, two fields of specialization.

ECO 5415—Statistical Methods in Economics (3) *Prereq: MAC 3234; coreq: ECO 6805.* Introduction to fundamental statistical concepts: estimation, hypothesis testing, linear regression, and analysis of variance.

ECO 5424—Econometric Models and Methods (3) *Prereq: ECO 5415.* Introduction to econometrics, including survey of classical econometric models as well as scope and method of econometrics.

ECO 5505—Public Economics: Tax Analysis and Policy (3) *Prereq: ECO 3100, 3101, or permission of instructor.* Introduction to welfare analysis and its application to tax policy: incidence and efficiency cost of taxes; overview of federal and state tax systems.

ECO 5545—Central Government Finance (3) *Prereq: ECO 2013, 2023.* Allocation of government functions and resources; property taxation, sales taxes, highway finance, business taxation, debt financing, and control. Emphasis on Florida's problems.

ECO 5556—State and Local Finance (3) *Prereq: ECO 2013, 2023.* Allocation of government functions and resources; property taxation, sales taxes, highway finance, business taxation; debt financing, and control. Emphasis on Florida problems.

ECO 6115—Microeconomic Theory I (3) *Coreq: ECO 6805 or equivalent.* Analysis, criticism, and restatement of neoclassical price and production theories. Demand, supply, cost of production, and price determination under various conditions of the market.

ECO 6116—Microeconomic Theory II (3) *Prereq: ECO 6115 or permission of department.* General equilibrium, imperfect competition, welfare economics, decision-making under uncertainty, and information economics.

ECO 6155—Neoclassical Economics (3) Analysis, criticism, and restatement of neoclassical theories concerning distribution of income. Rent, interest, wages, profits, personal distribution, supplementary distribution, and noncapitalistic distribution. Writings of Marshall, Hicks, Cassel, Boulding, Pigou, Fisher, Douglas, Knight, Stigler, and Schumpeter provide background for discussion.

ECO 6206—Macroeconomic Theory I (3) *Coreq: ECO 6115, 6805.* Classical, Keynesian, and new classical aggregate income and employment analysis. Demand for money. Inflation and unemployment. Monetary policy and stabilization. Time series and rational expectations models.

ECO 6207—Macroeconomic Theory II (3) *Prereq: ECO 5415, 6115, 6206, 6805, and permission of the department.* Dynamic and stochastic macroeconomic models and their use in studying economic growth and business cycles.

ECO 6216—Monetary Economics I (3) Contemporary monetary theory. The demand for money. Monetary policy and inflation, interest rates, and employment. The role of inflationary finance.

ECO 6217—Monetary Economics II (3) Economic instabilities in capitalistic society. Emphasis on forces operating to bring about changes in the general level of prices, including prices of productive agents, employment and income.

ECO 6405—Mathematical Economics I (3) *Prereq: ECO 6805 or equivalent.* Mathematical approach to microeconomic theory, including theory of the firm, theory of consumer behavior, and selected topics in market conditions.

ECO 6406—Advanced Mathematical Techniques and Applications to Economics (3) *Prereq: ECO 6115, 6206, 6805, or permission of instructor.* Applications of dynamic optimization and game theory to modeling of economic problems.

ECO 6426—Econometric Methods I (3) *Prereq: ECO 5415 or equivalent and MAS 3113 or equivalent.* Stochastic models. The general linear model and problems associated with its use in econometric research. Theory of the simultaneous equation approach, model construction, and estimation techniques.

ECO 6427—Econometric Methods II (3) *Prereq: ECO 6426 or AEB 6571.* Advanced econometric theory with applications to topics such as nonlinear estimation, limited dependent variable models, time-series analysis, and specification testing.

ECO 6435—Applied Time-Series Analysis and Dynamic Models (3) *Prereq: ECO 5424.* Applications in accounting, economics, finance and marketing.

ECO 6516—Public Revenue and Distribution (3) *Prereq: ECO 6115.* Incidence of taxation, excess burden of taxation, and design of optimal tax system.

ECO 6536—Public Expenditures and Collective Decisions (3) *Prereq: ECO 6206, 6115.* Theory of goods and externalities, evaluation of public expenditures, nature of collective choice, and voting behavior.

ECO 6617—The United States in the World Economy (1783-1970) (4) *Not designed for doctoral students in economics.* Interrelatedness of the United States' economy with other lands.

ECO 6705—International Economics (3) *Prereq: GEB 5795, ECP 6705, or permission of instructor. Not designed for doctoral students in economics.* Introduction, covering exchange rate regimes, trade accounts, national income determination, and trade barriers.

ECO 6706—Theory of International Trade (3) Historical and economic background of foreign trade; theory of international trade; fundamentals of international exchange; international commercial policies and international trade; exchange fluctuations and their control; international monetary institutions.

ECO 6716—International Economic Relations (3) Capital formation in the underdeveloped countries, economic integration, balance of payments and international monetary reform, the economic consequences of population pressures and economic relations between the advanced and other nations.

ECO 6805—Mathematical Methods and Applications to Economics (3) *Prereq: MAC 3233, 3234.* Application of mathematical techniques to economic problems, including constrained optimization.

ECO 6906—Individual Work in Economics (1-4; max: 8)

ECO 6910—Supervised Research (1-5; max: 5) S/U.

ECO 6940—Supervised Teaching (1-5; max: 5) S/U.

ECO 6957—International Studies in Economics (1-4; max: 12) *Prereq: admission to approved study abroad program and permission of department.* S/U.

ECO 6971—Research for Master's Thesis (1-15) S/U.

ECO 7165—Economics of Uncertainty (3) Multi-period problems in inventory theory, portfolio analysis, search, and firm behavior. Analysis of market behavior under uncertainty.

ECO 7429—Econometrics and Statistics Seminar (1-4; max: 8)

ECO 7938—Advanced Economics Seminar (1-4; max: 8) *For advanced graduate students in economics. Prereq: student must have completed graduate core program and have preliminary dissertation topic.*

ECO 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.

ECO 7980—Research for Doctoral Dissertation (1-15) S/U.

ECP 5606—Special Problems in Urban and Regional Economics (3; max: 6) *Prereq: ECP 5624.* Housing, land use, metropolitan financing, and forecasting.

ECP 5624—Regional Economics (3) *Prereq: ECO 2013, 2023 or permission of instructor.* Regional economic phenomena and the spatial distribution of economic activities. Analytical tools are developed and applied to urban and regional problems such as growth and decay, housing, land use, and transportation.

ECP 6405—Industrial Organization and Social Control (3) Economic and other characteristics of modern industrial structures. Relationships between industrial structure, business conduct, and economic performance. Measurement of concentration and evaluation of performance. Public policies toward monopoly, conspiracy, and competition.

ECP 6407—Public Policy and Social Control (3) *Designed for MBA candidates.* Problems in developing and applying concepts of public interest in a market economy. Relationships among industrial structure, business conduct, and economic performance. Measurement of concentration and evaluation of performance.

ECP 6426—Economics of Regulated Industries (3) Types and techniques of public control. Economic analysis and evaluation of regulatory and promotional policies. Administrative and legal aspects of the regulatory process. Special problems in particular industries.

ECP 6536—Health Care Economics I (3) *Prereq: ECO 6115.* Fundamental economic relations governing the production, consumption and financing of health care services. Characteristics of

demand and production relationships; response of supply, "shortages," and possibilities for factor substitution; insurance and organizational alternatives.

ECP 6705—Economics of Business Decisions (3) *Designed primarily for MBA candidates.* Synthesis and application of microeconomic theory and related business administration principles to managerial decision making through a problem-solving orientation.

ECP 6725—International Macroeconomics (3) *Prereq: ECP 6705. Designed primarily for MBA candidates. Not designed for doctoral students in economics.* Macroeconomic policies and their effects on the international business environment.

ECS 6015—Theory of Economic Development (3) Broad analytical, nonhistorical framework for examining economic underdevelopment and possible escape therefrom. Transition to secular economic growth and principles by which an underdeveloped country can achieve development objectives.

ECS 6025—Economic Development Seminar (3) Theory and problems of economic development pertinent to market and nonmarket economies. Emphasis on the relationship between economic system development and economic growth.

EDUCATIONAL LEADERSHIP
College of Education

GRADUATE FACULTY 1993-94

Acting Chairman: M. Y. Nunnery. *Graduate Coordinator:* J. W. Hensel. *Distinguished Service Professor (Emeritus):* J. L. Wattenbarger. *Professors:* P. A. Clark; P. S. George; J. W. Hensel; J. M. Nickens; M. Y. Nunnery; S. A. Sandeen; D. C. Smith; R. C. Wood. *Associate Professor:* D. S. Honeyman. *Assistant Professor:* L. S. Behar.

The Department offers programs leading to the Master of Education (nonthesis) and Master of Arts in Education (thesis) in curriculum and instruction with course concentrations in curriculum and instructional leadership; in educational leadership, with specializations in elementary and secondary administration, school business management, and vocational-technical administration; and in vocational, technical, and adult education with specializations in adult education and technical education. The Department also offers the Specialist in Education, Doctor of Education, and Doctor of Philosophy degrees in curriculum and instruction with specializations in curriculum and instruction theory and research, postsecondary education, supervision and curriculum development, and vocational, technical, and adult education; in educational leadership with specialization in elementary and secondary administration; and in higher education administration with specializations in community college leadership, university leadership, and vocational-technical administration.

A candidate for admission to the Department will be judged not only on the basis of quantitative criteria (listed elsewhere in this *Catalog*) but also in relation to prior experience, especially as it relates to career goals.

The Center for Community Education, the Institute of Higher Education, and the Center for School Improvement provide advanced graduate students with opportunities for research and study in their respective areas.

General Courses

EDA 6193—Educational Leadership: Instruction (3) Examination and analysis of role in curriculum change and school improvement.

EDA 6215—Communications in Educational Leadership (3) School/community relations and communication implications for educational leaders.

EDA 6905—Individual Work (1-6; max: 12 including EDG 6905 and EVT 6905)

EDA 6931—Special Topics (1-5; max: 10)

EDA 6971—Research for Master's Thesis (1-15) S/U.

EDA 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.

EDA 7980—Research for Doctoral Dissertation (1-15) S/U.

EDG 6905—Individual Work (1-6; max: 12 including EDA 6905 and EVT 6905) *Student must have approval of proposed project prior to registration in course.* For advanced students who wish to study individual problems under faculty guidance.

EDG 6910—Supervised Research (1-5; max: 5) S/U.

EDG 6931—Special Topics (1-4; max: 12 including EDA 6905) *Prereq: consent of department chairman.*

EDG 6940—Supervised Teaching (1-5; max: 5) S/U.

EDG 6971—Research for Master's Thesis (1-15) S/U.

EDG 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.

EDG 7980—Research for Doctoral Dissertation (1-15) S/U.

EVT 6933—Special Topics (1-4; max: 10) *Prereq: consent of department chairman.*

Curriculum and Instructional Leadership

EDG 6250—The School Curriculum (3) *Required in all graduate programs in curriculum and instruction.* Theoretical and research bases underlying the development of the total school program from kindergarten through community college. Basic curriculum course for graduate students.

EDG 6285—Evaluation in the School Program (3) Procedures and techniques of evaluation in school programs, with particular emphasis on needs assessment, school self-study, and course evaluation.

EDG 6691—Problems in Curriculum and Instruction (2-10; max: 10) Topics not available in regularly listed courses. For credit institutes, workshops, and short credit courses.

EDG 7222—Curriculum: Theory and Research (3) *Prereq: EDG 6250.* Theories of curriculum organization and a survey of curriculum research and patterns of curriculum.

EDG 7362—Instruction: Theory and Research (3) *Prereq: EDG 6250 or equivalent.* Theories of instructional design and improvement, models of teaching and research on teaching.

EDG 7391—Seminars on Instructional Leadership (3) *Prereq: EDS 6140, EDG 6285.* Review of theories of change applicable to education. Discussion of roles of instructional leaders using alternative models of change.

EDG 7665—Bases of Curriculum and Instruction Theory (3) *Prereq: EDG 6250 or equivalent.* Application of theory and research in the behavioral sciences to the development of curriculum and instruction theory. Topics include social forces, human development, learning theories.

EDG 7941—Field Experience in Curriculum and Instruction (1-4; max: 10) *Admission limited to advanced graduate students.* Supervised experiences appropriate to the student's professional goals.

EDS 6140—Supervision of Instruction (3) Systematic approaches to supervision of instructional personnel including observation and programs of continuing professional development.

Educational Administration

EDA 6061—Educational Organization and Administration (3) Basic concepts and practices in local, state, and federal organizations and administration.

EDA 6105—Institutional Research in Educational Leadership (3) Role of institutional research in educational systems including

applications, methodology, and external reporting. Emphasis on policy impact, planning, needs assessment, automated management information systems, and current practice.

EDA 6192—Educational Leadership: The Individual (3) The individual as a leader and the role of educational leaders in group development.

EDA 6195—Educational Policy Development (3) Contemporary research on political power in policy decision making and role of educational leaders in policy development.

EDA 6201—Business Affairs in Education (3) Role and functions of the business office.

EDA 6203—Educational Budgeting and Accounting Systems (3) Fiscal budgeting and accounting processes in schools.

EDA 6205—Educational Planning (3) Cooperative planning of educational programs. Skills and methodologies associated with developing annual and long-range comprehensive plans for meeting educational needs of school districts, colleges, and universities.

EDA 6222—Administration of School Personnel (3) Problems of the professional school staff and administration of staff personnel in public schools.

EDA 6225—Labor Relations in Public Education (3) Various aspects of employee, union, and management relationships in public education.

EDA 6232—Public School Law (3) The law as it affects the public school operation in America. Religion; desegregation; compulsory attendance; torts; curriculum; student control and discipline; and teacher freedoms, employment, and dismissal.

EDA 6242—Public School Finance (3) State, local, and federal financing of education.

EDA 6271—Utilization of Computers in Educational Leadership (3) Application of computer technology to leadership and management of educational enterprise.

EDA 6300—Leadership in Community Education (3) Contemporary theories and application of basic principles to administration of educational institutions and community agencies.

EDA 6503—The Principalship (3) Organization and administration of the school; emphasis on competencies necessary for leadership and management of the school center, both elementary and secondary.

EDA 6935—Problems in School Administration and Supervision (1-15; max: 15) In-service training through regularly scheduled on-campus work conferences open only to superintendents and supervisors; or a problems course, offered through extension or on campus, for superintendents, supervisors, principals, junior college administrators, and trainees for such positions. S/U.

EDA 6948—Supervised Practice in School Administration (1-15; max: 15) *Only advanced graduate students are permitted to enroll.* Students are given an opportunity to perform administrative duties under supervision. S/U.

EDA 7103—Theories of Educational Administration (3) *Prereq: one year of graduate study.* Theoretical constructs relative to the organization and administration of educational institutions.

EDA 7206—Organizational Leadership in Education (3) *Prereq: EDA 6192.* Development of concepts and refinements of skills associated with planning and organizing in educational institutions.

EDA 7260—Planning Educational Facilities (3) School plant survey methods are included. Field experience available.

EDA 7945—Practicum in Supervision and Administration (1-15; max: 15) A seminar and an internship in administration and supervision. S/U.

EDA 7990—Research Design in Educational Administration (3) *Prereq: EDF 7486 or equivalent. Open only to advanced students.* Problems in administration conceptualized and appropriate research procedures determined.

EEX 6511—Administration in Special Education (3) *Prereq: EEX 3010 or 6051 or permission of the instructor.* Local, state, and federal organization and administration, with emphasis on the administration of services to handicapped children.

EEX 7535—Seminar in Administration and Supervision of Special Education (3; max: 6) *Prereq: EDA 6061, EEX 6511.* Current problems in the provision of special education services in local, state, and federal programs.

EEX 7945—Practicum: Special Education Administration (3-9; max: 12) *Prereq: EEX 7535, six credits of special education, six credits of educational administration, and written request to enroll six weeks prior to registration.*

Higher Education

EDA 7236—The Law and Higher Education (3) The legal structure of higher education, religion, academic freedom of faculty, employment, due process, students' rights of speech and expression, search and seizure, desegregation, and tort liability.

EDA 7244—The Financing of Higher Education (3) Junior college through university. Theoretical basis for use of tax funds for education, student fees and tuition, state methods for financing, planning, cost benefit, budgeting, federal role, and capital outlay.

EDA 7550—Higher Education Administration (3) Educational policies, functions, and practices.

EDA 7565—Coordination of State Systems of Higher Education (3) Organizational structure and the basic principles of coordination and control of higher education at state and regional levels. Principles of leadership expressed through controlling and coordinating boards: role of boards and staff in planning development and operation; state, regional, and national accrediting agencies.

EDH 6053—The Community Junior College in America (3) Programs, issues, and problems.

EDH 6066—American Higher Education (3) History, philosophy, and policies, with emphasis on current practices and problems.

EDH 6067—Seminar: International Higher Education (3) Characteristics of selected foreign higher education systems with emphasis on history and philosophy, access, curriculum and instruction, student and faculty characteristics, governance, management, and finance.

EDH 6305—College and University Teaching (3) Contemporary issues, problems, and research related to the role of the college faculty member and the teaching-learning process.

EDH 6946—Practicum in College Teaching I (3) *Prior arrangements must be made with the coordinating professor of the College of Education.* Provision made for the student to teach under the supervision of a professor at either the community college, four-year college, or university level. Seminars cover topics related to improvement of college teaching.

EDH 6947—Practicum in College Teaching II (3) *Prior arrangements must be made with the coordinating professor of the College of Education.* Provision made for the student to teach under the supervision of a professor at either the community college, four-year college, or university level. Seminars cover topics related to improvement of college teaching.

EDH 7916—Contemporary Research on Higher Education (3) Examination and analysis of research related to higher education. Implications for application of findings for improvement of colleges and universities.

EDH 7937—Seminar: Curriculum in Higher Education (3) Issues and problems in college and university curricula. Curriculum planning, implementation, and evaluation.

Vocational, Technical, and Adult Education

ADE 6260—Organization and Administration of Adult Education (3) Adult education in the United States: the role of administration; the job of the local director related to Florida law and regulations.

ADE 6671—Adult Education: Progress and Prospects (3) An overview of the historical development and current status of adult education in America; characteristics of the adult learner; trends.

EVT 6170—Technical Education in Post-High School Programs (4) Analysis of technical education in modern society, with emphasis on college and other post-high school programs leading to the Associate of Science or similar degrees or certificates of competency in technical and semi-professional occupations.

EVT 6264—Administration of Vocational Education (3) Basic principles of administering a program on national, state, and local levels.

EVT 6265—Supervision of Vocational and Adult Education (3) Concepts and procedures pertaining to supervision of different facets of local, state, and national programs.

EVT 6664—Vocational Education and Community Interaction (3) Socioeconomic forces; school-community relations; employee-employer relations; principles, concepts, and practices affecting policy and program planning.

EVT 6905—Individual Work in Vocational, Technical, and Adult Education (1-6; max: 12 including EDA 6905 and EDG 6905) For advanced students wishing to study under faculty guidance. Before registering, a student must have approval of the proposed study.
EVT 7930—Seminar in Vocational and Technical Education (3) *Prereq: post-master's standing.* Current research and an overview of the total program.

ELECTRICAL ENGINEERING
College of Engineering

GRADUATE FACULTY 1993-94

Chairman: M. A. Uman. *Associate Chairman:* L. W. Couch II. *Graduate Coordinator:* G. Bosman. *Graduate Research Professors:* R. E. Kalman *(Emeritus)*; C. T. Sah; J. T. Tou *(Emeritus). Bell South Eminent Scholar:* A. N. Venetsanopoulos. *Pittman Eminent Scholar:* C. T. Sah. *Bell South Professor:* D. G. Childers. *Professors:* G. Bosman; T. E. Bullock; D. E. Burk; D. P. Carroll; E. R. Chenette *(Emeritus)* (Eglin Center); D. G. Childers; L. W. Couch, II; K. L. Doty; O. I. Elgerd *(Emeritus)*; J. G. Fossum; J. Hammer; S. S. Li; F. A. Lindholm; A. Neugroschel; J. R. O'Malley; P. Z. Peebles, Jr.; J. C. Principe; V. Ramaswamy; C. V. Shaffer *(Emeritus)*; J. R. Smith; R. Srivastava; J. Staudhammer; S. Y. W. Su; F. J. Taylor; M. A. Uman; J. K. Watson; R. Yii (Eglin Center); P. Zory. *Associate Professors:* A. Arroyo; A. Domijan, Jr.; W. R. Eisenstadt; R. M. Fox; H. Lam; H. Latchman; M. H. Latour *(Emeritus)*; M. E. Law; S. L. Miller; K. D. Ngo; T. Nishida; E. M. Thomson. *Assistant Professors:* J. M. Anderson; U. Das; W. W. Edmonson; J. G. Harris; J. Li; C. A. Schwartz.

The Department of Electrical Engineering offers the Master of Engineering, Master of Science, Engineer, and Doctor of Philosophy degrees. The Department offers graduate study and research in communications, computer engineering, device and physical electronics, digital signal processing, electric energy systems, electromagnetics, electronic circuits, photonics, and systems and controls.

Graduate students in the Department of Electrical Engineering have bachelor's degrees from many areas—electrical engineering, other engineering disciplines, mathematics, physics, chemistry, and other technical fields. The Department of Electrical Engineering offers both thesis and nonthesis options for the master's degree.

In the *thesis option* a student shall complete a minimum of 33 semester credit hours with a maximum of 6 semester credit hours of EEL 6971 (Research for Master's Thesis). While the Graduate School sets the minimum requirements, the supervisory committee determines the appropriate number of thesis hours a student shall be required to take for the thesis. Other course requirements include a minimum of 12 hours of 6000-level course credit in all fields and a minimum of 18 hours at the 5000 or 6000 level in electrical engineering. Excluded from satisfying these course requirements are 5905 and 6905 (Individual Work), 6910 (Supervised Research), 6932 (Graduate Seminar), 6940 (Supervised Teaching), and 6971 (Research for Master's Thesis). No more than six hours of Individual Work (5905 or 6905) may be counted toward the degree. Students who accept research assistantships will normally take the thesis option.

In the *nonthesis option* a student shall complete a minimum of 33 semester credit hours with a maximum of 4 semester credit hours of Individual Work (5905 or 6905). The course requirements include a minimum of 21 semester credit hours of 6000-level course credit in all fields and a minimum of 18 semester credit hours at the 5000 or 6000 level in electrical engineering. Excluded from satisfying these course requirements are 5905 and 6905 (Individual Work), 6910 (Supervised Research), 6932 (Graduate Seminar), 6940 (Supervised Teaching) and 6971 (Research for Master's Thesis).

The department also offers a combined B.S.E.E./M.S. degree program. This program allows qualified students to earn both a bachelor's degree and master's degree with a savings of one semester. Qualified students can begin their master's program while seniors and count 12 hours of specified electrical engineering graduate courses for both bachelor's and master's degree requirements. Seniors admitted to the combined program will be eligible for teaching or research assistantships. B.S.E.E./M.S. program admission requirements are (1) satisfaction of Graduate School admission requirements for master's degree, (2) an upper-division (undergraduate) GPA of at least 3.6, and (3) completion of all electrical engineering bachelor's degree requirements except for EEL4914 and electrical engineering technical electives.

All prospective doctoral students must take the written part of the Ph.D. qualifying examination within the first three semesters. Other requirements for the doctoral degree, as well as requirements for master's degrees, are given in the Electrical Engineering Department's Graduate Guidelines and in the front section of this *Catalog*.

The following course listing indicates the major areas of faculty interest. Special topics courses EEL 5934 and EEL 6935 cover a wide variety of subjects for which there are no present courses.

CDA 6108—Advanced Computer Architecture (3) *Prereq: EEL 5761 or COP 5622.* Evaluation, study, and comparison of computer systems. Development of formal and informal models of computer architecture.
EEL 5182—State Variable Methods in Linear Systems (3) *Prereq: EEL 3135.* Linear algebra and state variable methods for design and analysis of discrete and continuous linear systems.
EEL 5218—High Voltage DC Transmission Systems (3) *Prereq: introductory course in electric power.* Line-commutated converter analysis, rectifier and inverter controls, system protection, harmonics, supplementary controls, and multiterminal operation.
EEL 5219—Analysis of Power Transmission Lines (3) *Prereq: EEL 3211, MAS 3114 or equivalents.* Calculation of multiphase transmission line parameters for typical power line configurations. Modal analysis of wave propagation. Line models and computer applications for transient analysis.
EEL 5268—Control of Electric Energy Systems (3) *Prereq: EEL 4213 or equivalent.* Voltage, frequency, and power control in normal and emergency system states. Effects of channel crosscoupling. Dynamic modeling with emphasis on simplified model versions.
EEL 5317C—Introduction to Power Electronics (4) *Prereq: EEL 3304, 3396; coreq: EEL 4657.* Components and circuits for power applications. Switched-mode power supplies.
EEL 5320—Bipolar Analog IC Design (3) *Prereq: EEL 3304.* Amplifier stages, active loads, output stages, op-amps, feedback, frequency response, compensation.
EEL 5322—VLSI Circuits and Technology (3) *Prereq: EEL 3396, 3304.* Introduction to VLSI circuit technology and manufacturing. Fabrication, device models, layout, parasitics, and simple gate circuits.

EEL 5352—Introductory Quantum Theory for Semiconductors (3) *Prereq: EEL 3396 and 3472 or equivalent.* Old quantum theory, operators, Dirac notation, crystals, band structure, quasi-classical electron and hole dynamics.

EEL 5370—Applied Electronics (3) Modern communication circuits.

EEL 5441—Fundamentals of Photonics (3) *Prereq: EEL 3472 and 3396.* Review of electromagnetic fields and waves, energy bands in semiconductors, p-n junctions and optical properties of semiconductors. Fundamentals of optical modulators and switches, laser theory, laser characteristics, photodetectors, optical waveguides, and photonic applications.

EEL 5485—Applied Magnetics (3) Introduction to the design and use of magnetic components. Piecewise linear modeling. Inductors, dc to dc converters, tape recording, and magnetic bubble technology.

EEL 5490—Lightning (3) *Prereq: EEL 3472.* Introduction to lightning discharge processes. Electromagnetics relevant to lightning measurements. Applications for determining lightning charge, current, location, and characteristics. Lightning protection.

EEL 5544—Noise in Linear Systems (3) Passage of electrical noise and signals through linear systems. Statistical representation of random signals, electrical noise, and spectra.

EEL 5547—Introduction to Radar (3) *Prereq: EEL 4516 or 5544.* Basic principles of cw and pulsed radar; angle, range, and doppler tracking; accuracy and resolution; signal design.

EEL 5631—Digital Control Systems (3) *Prereq: EEL 3701, 4657.* A study of the digital computer as a control element, classical sampled data control theory, and application with microcomputers.

EEL 5718C—Computer Communications (3) *Prereq: EEL 4514.* Design of data communication networks: modems, terminals, error control, multiplexing, message switching, and data concentration.

EEL 5719—Digital Filtering (3) Analysis and design of digital filters for discrete signal processing; spectral analysis; fast Fourier transform.

EEL 5745C—Microcomputer Hardware and Software (4) *Prereq: EEL 3701 and EEL 3304 or 3003.* Functional behavior of microprocessors, memory, peripheral support integrated circuit hardware; microcomputer system and development software; applications.

EEL 5761—Hardware-Software Interactions: Time Sharing Systems (3) *Prereq: EEL 4744C or 4712C.* Resource sharing and allocation, I/O, and I/O interfaces within context of time sharing computer architecture.

EEL 5830—Human-Computer Interaction (3) *Prereq: EEL 3701.* Designing human-computer interfacing; cognition, perception, sensing, displays, speech, dialogs, and graphics.

EEL 5840—Elements of Machine Intelligence (3) Engineering and hardware concepts pertaining to design of intelligent computer systems.

EEL 5905—Individual Work (1-4; max: 6) *Prereq: consent of adviser.* Selected problems or projects.

EEL 5934—Special Topics in Electrical Engineering (1-3; max: 8)

EEL 6134—Nonlinear Control Systems (3) *Prereq: EEL 5182.* Introduction to nonlinear control; mathematical foundations of nonlinear controls. Poincare-Bendixson theory; Liapunov theory; input/output theory of nonlinear systems; internal stability; topics in modern nonlinear control.

EEL 6171—Advanced System Theory (4) Structural analysis of linear dynamical systems. Invariance, F and G invariance, constrained reachability, pole assignment and stability, advanced topics in linear algebra useful in mathematical system theory.

EEL 6200—Advanced Analysis of Electric Machines (3) *Prereq: EEL 3211, MAS 3114 or equivalents.* Principles of electromechanical energy conversion, reference frame theory, analysis and modeling of AC and DC machines, state variable formulation of systems with electromechanical devices.

EEL 6264—Advanced Electric Energy Systems I (3) *Prereq: EEL 5268 or consent of instructor.* Energy systems planning and operation with emphasis on advanced analysis methodologies and computer simulation.

EEL 6265—Advanced Electric Energy Systems II (3) *Prereq: EEL 6264.* Continuation of EEL 6264 with additional emphasis given to the new electric energy technologies.

EEL 6311—Electronic Circuits I (3) *Prereq: required undergraduate electronics and control sequences.* Analysis and design of operational amplifier circuits, other topics in electronic circuit design.

EEL 6312—Electronic Circuits II (3) *Prereq: EEL 5320 or 6311.* Design of active circuits, analysis and design of phase-locked loops, and frequency synthesizers.

EEL 6318—Smart Power Integrated Circuits (3) Theory and applications. PICs include one or more power devices and control circuitry. Applications include motor drives, power supplies, and telecommunications.

EEL 6321—MOS Analog IC Design (3) *Prereq: EEL 5320 or 6311.* Design of analog circuits in CMOS IC technology. MOS switches, MOS op amp circuits, circuit simulation using SPICE.

EEL 6323—Advanced VLSI Design (3) *Prereq: EEL 5322.* Advanced very large scale integrated circuit design, testability, and performance evaluation. Use of industrial VLSI software. Building an advanced CMOS VLSI circuit.

EEL 6324—Silicon Fabrication Processes (3) *Prereq: EEL 5322.* Advanced modeling of physics of silicon fabrication. Lithography, deposition, etching, oxidation, implantation, and diffusion. Oriented toward silicon device fabrication.

EEL 6325—Computer Simulation of Integrated Circuits and Devices (3) *Prereq: graduate standing.* Basic methods of numerical simulation of semiconductor devices and electronic circuits, with reference to PISCES and SPICE. PDE discretization; numerical integration, Newton/iterative linearization, linearized system solution.

EEL 6328—Microwave IC Design (3) Fundamentals of microwave integrated circuit design. Use of computer software to design simple microwave circuits. Microwave circuit testing.

EEL 6354—Device-Related Solid State Physics (3) *Prereq: consent of instructor.* Recombination mechanisms and recombination statistics; tunneling and thermionic emission in various semiconductor contexts; effective-mass theory and the dynamics of electrons in crystals. Efficiencies of energy conversion.

EEL 6381—Network Representation of Solid-State Devices (3) *Prereq: graduate standing.* Relationship between dynamic large- and small-signal equivalent circuit models and the physical mechanisms governing device operation. Special attention given to approximations and methods of reasoning. Emphasis on large-signal, dynamic models for MOS bipolar transistors and related devices.

EEL 6382—Semiconductor Physical Electronics I (3) Crystal structures; imperfections; statistics; lattice dynamics; energy band theory. Equilibrium properties of electrons and holes in semiconductors. Electronic transport phenomena. Boltzmann's equation and transport coefficients in semiconductors.

EEL 6383—Semiconductor Physical Electronics II (3) *Prereq: EEL 6382.* Scattering mechanisms. Recombination-generation and trapping processes; optical properties. Excess carrier phenomena. Photoelectric effects in semiconductors. Metal-semiconductor contacts. Opto-electronic devices. Junction and MOS devices. Superconductors and Josephson Junction devices.

EEL 6388—Fluctuation Phenomena (3) Noise theory with applications to electrical engineering. Sources of noise in electronic devices; statistical and spectral representation. Influence of noise upon the performance of circuits and systems. Limitation of detectors and instruments due to noise.

EEL 6397—Semiconductor Device Theory I (3) *Prereq: EEL 3396.* Semiconductor material properties, equilibrium and nonequilibrium processes, quasi-Fermi levels, pn junctions; charge-control modeling; high level injection, heavy doping effects.

EEL 6398—Semiconductor Device Theory II (3) *Prereq: EEL 6397.* Basic mechanisms in bipolar junction transistors, low- and

high-current effects; fundamental principles of the MOS system, surface effects on pn junctions, MOS field-effect transitors.

EEL 6443—Integrated and Fiber Optics (3) *Prereq: EEL 5441.* Review of electromagnetic waves. Dielectric interfaces, propagation in graded-index media, slab waveguides, coupled waveguides, waveguide fabrication and characterization.

EEL 6444—Advanced Guided Wave Devices (3) *Prereq: EEL 6443.* Review of waveguides. Mode coupling, waveguide branches, polarizers, filters, multiplexers, modulators/switches, optical filters, optoelectronic sources, and monolithic integration.

EEL 6447—Laser Electronics (3) *Prereq: EEL 3473 and 5441 or equivalent.* Study of lasers from basic principles to operational characteristics.

EEL 6448—Semiconductor Opto-Electronic Devices (3) *Prereq: EEL 5447.* Physical principles, including optical properties, optical gain and absorption, optical waveguides, laser oscillations; types of semiconductor lasers, LEDs, optical detectors and applications.

EEL 6452—Quantized Structures and Opto-Electronic Devices (3) *Prereq: EEL 3473, 4351, and 6382 or equivalents.* Fundamental properties of quantized structures, growth of III-V heterostructures, strained layer superlattices, optical device application of MQWs, quantum defined heterostructure lasers, bandgap engineering, trapping and associated effects of heterostructures.

EEL 6486—Electromagnetic Field Theory and Applications I (3) *Prereq: undergraduate course in fields and waves.* Advanced electrostatics, magnetostatics, time-varying electromagnetic fields, wave propagation, waveguides.

EEL 6487—Electromagnetic Field Theory and Applications II (3) *Prereq: EEL 6486.* Electromagnetic radiation, antennas, wave propagation in anisotropic media.

EEL 6502—Adaptive Signal Processing (3) *Prereq: EEL 5719, 5544.* Theory of adaptation with stationary signals; performance measures. LMS, RLS algorithms. Implementation issues and applications.

EEL 6503—Signal Representation and Spread Spectrum Systems (3) *Prereq: EEL 5544 and 6535.* Representation of signals and noise by orthogonal function series and by use of complex envelopes. Introduction to spread spectrum systems for military and commercial applications.

EEL 6505—Digital Signal Processing (3) *Prereq: EEL 5544, 5719.* Measurement and analysis of signals and noise. Digital filtering and spectral analysis; fast Fourier transform.

EEL 6507—Queueing Theory and Data Communications (3) *Prereq: EEL 5544.* Introduction to basic queueing models; performance analysis of multiple access protocols; error control strategies.

EEL 6509—Space Communications (3) *Prereq: EEL 5544.* Telemetering systems, space communication links, satellite communication systems, space tracking, and navigation systems.

EEL 6524—Statistical Decision Theory (3) *Prereq: EEL 5544.* Hypothesis testing of signals in the presence of noise by Bayes, Neyman-Pearson, minimax criteria; estimation of signal parameters.

EEL 6535—Theory of Communication (3) *Prereq: EEL 5544.* Optimum receiver principles; analysis of digital and analog communication systems in the presence of noise; modeling of communication channels.

EEL 6548—Radar I (3) *Prereq: EEL 5544.* Basic concepts, wave propagation, antennas, radar equation, cross section, radar signals, detection.

EEL 6549—Radar II (3) *Prereq: EEL 6548.* Continuation of EEL 6548. Ideal radar, resolution, measurement accuracy, angle tracking methods, miscellaneous topics.

EEL 6550—Error Correction Coding (3) *Prereq: EEL 5544 or equivalent; coreq: EEL 5544 or 4516.* Introduction to abstract algebra, block coding and decoding, convolutional coding and decoding, trellis coded modulation, run-length-limited codes.

EEL 6562—Image Processing and Computer Vision (3) Pictorial data representation; feature encoding; spatial filtering; image enhancement; image segmentation; cluster seeking; two-dimensional z-transforms; scene analysis; picture description language; object recognition; pictorial database; interactive graphics; picture understanding machine.

EEL 6585—Computer Speech Systems (3) *Prereq: EEL 6586.* Design and analysis of speech synthesizers; speech recognizers; speaker recognition, verification, and identification; intelligent interface systems; speech understanding.

EEL 6586—Automatic Speech Processing (3) *Prereq: EEL 5719.* Various models of speech production and perception. Operation of speech synthesizers. Discussion of speech recognition. Mathematical models of speech signals.

EEL 6614—Modern Control Theory I (3) *Prereq: EEL 5182.* Optimization of systems using the calculus of variations, dynamic programming, and the maximum principle. Extensive study of the linear plant with a quadratic performance index. Observers and dynamic compensators.

EEL 6615—Modern Control Theory II (3) *Prereq: EEL 5182 or consent of instructor.* Kalman Bucy filters. Discrete and continuous filtering. Computational techniques. Smoothing and system identification techniques.

EEL 6617—Linear Multivarible Control (3) *Prereq: MAS 4015, EEL 5182.* Transfer matrix theory of systems, emphasis on feedback, internal stability, model matching, and assignment of invariant factors.

EEL 6619—Robust Control Systems (3) *Prereq: EEL 5182.* Analysis and design of multivariable control systems in presence of uncertainties.

EEL 6667—Kinematics and Dynamics of Robot Manipulators (3) Algebraic formulation of robot manipulator motion. Homogeneous matrices. Methods for computing forward and reverse kinematic solutions of robot manipulators. Robot differential displacements and Jacobians. Newton-Euler and Lagrangian derivations of manipulator dynamics.

EEL 6668—Intelligent Robot Manipulator Systems (3) *Prereq: EEL 6667.* Trajectory planning and computation for robot manipulators. Splines. Force compliance and hybrid control. Machine perception and intelligence: touch, vision, collision avoidance, automatic task planning. Modeling a robotic manufacturing work cell. Robot computer languages.

EEL 6702—Advanced Topics in Digital Signal Processing (3) *Prereq: analysis and design of digital filters.* Introduction to number transforms, complexity of algorithms, and finite fields. Development of transforms and digital filter using algebraic operators and finite fields plus the technological consideration of DSP system and system integration.

EEL 6733—Abstract Machines and Languages (3) Logic, set theory, modern algebra, finite and infinite state machines, grammars, language oriented machines.

EEL 6767—Database Engineering (3) *Prereq: EEL 4713C.* Architecture of database management system, data models and languages, design, integrity, security, concurrency control, distributed database management.

EEL 6769—Hardware-Software Interactions: Nonnumeric Processing (3) *Prereq: EEL 6767 or CIS 6120 or consent of instructor.* Information representations; content and context search methods; associative memories, retrieval language mapping; parallel processing; hardware and software garbage collections.

EEL 6799—Topics in Computer Engineering (3) Research topics relevant to computer engineering, including, but not limited to, robotics, graphics, database management, algorithm design, languages, machine intelligence.

EEL 6824—Algorithm Design and Analysis (3) Methods and techniques for developing and evaluating algorithms. Functional complexity, computational bounds, program verification and proof methods.

EEL 6825—Pattern Recognition and Intelligent Systems (3) Decision functions; optimum decision criteria; training algorithms; unsupervised learning; feature extraction, data reduction; potential functions; syntactic pattern description; recognition grammars; machine intelligence.

EEL 6841—Machine Intelligence and Synthesis (3) *Prereq: EEL 5840.* Theory of machine intelligence applied to general problem of engineering intelligent computer systems and architecture. Applications emphasized.
EEL 6905—Individual Work (1-4; max: 6) *Prereq: consent of adviser.* Selected problems or projects.
EEL 6910—Supervised Research (1-5; max: 5) S/U.
EEL 6932—Graduate Seminar (1; max: 12) Discussion of topics in fields of graduate study and research. S/U.
EEL 6935—Special Topics in Electrical Engineering (1-4; max: 12, including EEL 5905 and 6905)
EEL 6940—Supervised Teaching (1-5; max: 5) S/U.
EEL 6971—Research for Master's Thesis (1-15) S/U.
EEL 6972—Research for Engineer's Thesis (1-15) S/U.
EEL 7936—Advanced Topics in Electrical Engineering (1-4; max: 6)
EEL 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.
EEL 7980—Research for Doctoral Dissertation (1-15) S/U.

ENGLISH
College of Liberal Arts and Sciences

GRADUATE FACULTY 1993-94

Chair: P. B. Craddock. *Graduate Coordinator:* E. J. Langland. *Graduate Research Professor:* J. Seelye. *Marston/Milbauer Professor of English:* N. N. Holland. *Professors:* D. Ault; R. E. Brantley; A. C. Bredahl, Jr.; C. S. Carnell; R. H. Carpenter; I. G. Clark; D. A. Cottom; P. B. Craddock; H. E. Crews; R. A. deBeaugrande; A. M. Duckworth; D. Greger; S. R. Homan; R. B. Kershner, Jr.; E. J. Langland; J. P. Leavey; D. Leverenz; D. M. Locke; W. Logan; K. McCarthy; B. McCrea; M. Nelson; M. New; B. J. Paris; J. B. Pickard; P. Powell; R. A. Shoaf; J. Smith; M. C. Turim; J. B. Twitchell; G. L. Ulmer. *Associate Professors:* W. Bargad; T. K. Beyette; J. O. Cech; C. A. Flinn; A. M. Gordon; M. A. Hill-Lubin; A. Jones; W. A. Losano; S. Nygren; J. M. Perlette; R. B. Ray; M. A. Reid; P. L. Rudnytsky; M. Sandor; M. J. Schueller; C. G. Snodgrass; R. M. Thompson; R. S. Thomson; C. E. Tillman. *Assistant Professors:* M. C. Bryant; B. C. Schwartz; S. A. Smith.

The Department of English offers the Master of Arts degree with specialization in literature, creative writing, and linguistics, the Master of Fine Arts degree with specialization in creative writing, and the Doctor of Philosophy degree with specialization in literature and linguistics. The Department also offers a nonthesis option for the Master of Arts degree.

Specific areas of specialization for the Doctor of Philosophy include linguistics, Medieval, Renaissance, Restoration and 18th-century, and 19th-century British literature, American literature to 1900, contemporary British and American literature, critical theory, cultural studies, and children's literature. Specialization in the literary study of media is also possible.

After the first year of doctoral work all students must undergo a screening process for actual admission into the doctoral program; prior to this time, all admissions to the doctoral program are probationary.

New graduate students should have completed an undergraduate English major of at least 24 semester hours, and doctoral students should have a Master of Arts degree in English. Full information concerning courses of study is available from the Graduate Coordinator.

AML 6017—Studies in American Literature Before 1900 (3; max: 12)
AML 6027—Studies in 20th Century American Literature (3; max: 12)
CRW 6130—Fiction Writing (3; max: 12)
CRW 6166—Studies in Literary Form (3; max: 6) *Prereq: permission of instructor.* Formal aspects of literature.
CRW 6331—Verse Writing (3; max: 12)
CRW 6906—Individual Work (1-3; max: 12) Individual study in reading literature and criticism, required for MFA specialization in creative writing.
ENG 6016—Psychological Approaches to Literature (3; max: 6)
ENG 6018—Studies in Literary Criticism (3; max: 12)
ENG 6137—The Language of Film (3)
ENG 6138—Studies in the Movies (3, max: 12)
ENG 6718—Stylistics (3)
ENG 6906—Individual Work (1-3; max: 12)
ENG 6910—Supervised Research (1-5; max: 5) S/U.
ENG 6971—Research for Master's Thesis (1-15) S/U.
ENG 7939—Seminar in Variable Topics (1-5; max: 12)
ENG 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.
ENG 7980—Research for Doctoral Dissertation (1-15) S/U.
ENL 6206—Studies in Old English (3; max: 12)
ENL 6216—Studies in Middle English (3; max: 12)
ENL 6226—Studies in Renaissance Literature (3; max: 12)
ENL 6236—Studies in Restoration and 18th-Century Literature (3; max: 12)
ENL 6246—Studies in Romantic Literature (3; max: 12)
ENL 6256—Studies in Victorian Literature (3; max: 12)
ENL 6276—Studies in 20th-Century British Literature (3; max: 12)
ENL 6335—Studies in Shakespeare (3)
LAE 6940—Supervised Teaching (1-5; max: 5) S/U.
LAE 6947—Practicum in the Teaching of College English (2) S/U.
LIN 6137—Studies in English Linguistics (3)
LIN 7939—Seminar in Linguistics (3; max: 12)
LIT 5186—Studies in Irish Literature (3; max: 12)
LIT 6017—Studies in Fiction (3; max: 12)
LIT 6037—Studies in Verse (3; max: 12)
LIT 6047—Studies in Drama (3; max: 12)
LIT 6309—Communications and Popular Culture (3) Study of the origins and qualities of the popular arts in modern society.
LIT 6327—Studies in Folklore (3; max: 12)
LIT 6934—Variable Topics (1-5; max: 12) Studies in topics not normally offered in the regular curriculum, including intensive study of topics within a literary period, extensive study of motifs crossing several periods, and studies in various national or ethnic literatures (African, Afro-American, Jewish, Scots)
SPC 6239—Studies in Rhetorical Theory (3; max: 9) Examination of ancient, medieval, renaissance, and modern writers who have influenced rhetorical thought, criticism, speaking, and writing.

ENTOMOLOGY AND NEMATOLOGY
College of Agriculture

GRADUATE FACULTY 1993-94

Chairman: J. L. Capinera. *Graduate Coordinator:* A. C. Tarjan. *Fischer, Davies, and Eckes Eminent Scholar:* M. Hoy. *Professors:* A. Ali; R. H. Baker; R. M. Baranowski; C. S. Barfield; D. Borovsky; D. G. Boucias; J. F. Butler; J. L. Capinera; C. C. Childers; H. L. Cromroy; D. W. Dickson; R. A. Dunn; T. C. Emmel; J. H. Frank; P. D. Greany; V. Gupta; D. H. Habeck; D. W. Hall; D. C. Herzog; F. A. Johnson; J. L. Knapp; P. G. Koehler; J. E. Lloyd; C. S. Lofgren; L. P. Lounibos; M. S. Mayer; C. W. McCoy, Jr.; R. T. McSorley; E. R. Mitchell; R. F. Mizell, III; P. B. Morgan; J. L. Nation; J.

K. Nayar; H. N. Nigg; J. H. O'Bannon; H. Oberlander; R. S. Patterson; J. R. Rey; J. R. Rich; M. T. Sanford; D. J. Schuster; D. E. Short; F. Slansky, Jr.; G. C. Smart, Jr.; J. L. Stimac; J. R. Strayer; J. H. Tsai; J. H. Tumlinson III; V. H. Waddill; T. J. Walker; H. Weems; B. R. Wiseman; R. F. Woodruff; S. J. Yu. *Associate Professors:* J. C. Allen; D. R. Barnard; H. W. Browning; D. A. Carlson; R. H. Cherry; L. W. Duncan; R. P. Esser; C. W. Fatzinger; S. M. Ferkovich; J. L. Foltz; J. E. Funderburk; R. Giblin-Davis; H. G. Hall; F. W. Howard; G. L. Leibee; J. E. Maruniak; J. R. McLaughlin; J. W. Noling; L. S. Osborne; J. Pena; J. F. Price; R. H. Scheffrahn; J. A. Seawright; D. L. Silhacek; R. K. Sprenkel; L. A. Stange; P. A. Stansly; N. Y. Su; P. E. A. Teal; A. H. Undeen. *Assistant Professors:* R. J. Brenner; G. R. Buckingham; A. F. Cockburn; D. A. Focks; A. M. Handler;. J. B. Heppner; J. A. Hogsette; D. T. Kaplan; D. L. Kline; P. J. Landolt; S. D. Porter; P. D. Shirk; J. M. Sivinsky; M. C. Thomas; R. K. Vander Meer; S. E. Webb; D. F. Williams; D. P. Wojcik.

The Department of Entomology and Nematology offers the Master of Agriculture, Master of Science, and Doctor of Philosophy degrees in entomology and nematology. Members of the graduate faculty include the department resident faculty, faculty located on University of Florida campuses away from Gainesville, scientists of the U.S. Department of Agriculture, and scientists with other State of Florida agencies such as the Division of Plant Industry and Florida State Department of Agriculture and Consumer Service. The graduate faculty is qualified to direct graduate students in all specialities of entomology, nematology, and acarology.

New graduate students should have background in biology, chemistry, physics, and mathematics and knowledge of basic entomology or nematology. Minor deficiencies may be made up after entering graduate school.

General requirements for graduate degrees are established by the Graduate School and listed elsewhere in this Catalog. A specific program of study is prepared by the appointed supervisory committee for each student. Ph.D. qualifying examinations are administered on campus by the student's supervisory committee plus two other faculty members appointed by the chairman of the department.

AGG 5505—Plant Protection in Tropical Ecosystems (4) *Prereq: PMS 3010,4401 or equivalents; or consent of instructor.* Concepts of farming systems, integrated pest management and the design of viable plant protection strategies in human and agricultural systems of the worldwide tropics. Comparison of acceptable methods of managing pest organisms.

AGG 6830—Grant Writing for Agriculture and Natural Resources (2) *Prereq: admitted to doctoral program.* Preparation, submission, and management of competitive grants, including operations of national review panels and finding sources of extramural funding.

ENY 5151C—Techniques in Insect Systematics (2) *Prereq: ENY 3005 or NEM 3002 or equivalent.* Procedures and techniques used to study systematics of insects and related organisms.

ENY 5222C—Biology and Identification of Urban Pests (2) *Prereq: consent of instructor.* Biology, behavior, identification, damage recognition of selected species that infest houses, damage structures, and affect pets and humans.

ENY 5226C—Principles of Urban Pest Management (2) *Prereq: consent of instructor.* Methods of controlling household, structural, and occasional pests. Emphasis on chemical and nonchemical control of cockroaches, termites, and fleas.

ENY 5241—Biological Control of Insects (4) *Prereq: ENY 3005.* Principles involved in the natural and biological control of insects.

ENY 5580—General Acarology (3) *Prereq: ENY 3005 or equivalent or permission of instructor.* Study of mites; lectures and laboratories related to biology, morphology, taxonomy of Acari. Emphasis on importance of mites in relation to integrated pest management programs.

ENY 5611—Immature Insects (4) *Prereq: ENY 4161.* Structure and identification of immature forms of insects, especially the Holometabola.

ENY 5810C—Information Techniques in Research (2) Sources of research information and methods for acquiring, storing, retrieving, and presenting it. Emphasis on effective use of microcomputers.

ENY 5885C—Extension Entomology and Nematology (2) Extension philosophy and methodologies related to insect and nematode management.

ENY 6130C—Taxonomy of Parasitic Hymenoptera (2) *Prereq: 4161 or 6166 or permission of instructor.* Taxonomic study of various groups of parasitic Hymenoptera, including their collection, preservation, and identification.

ENY 6166—Insect Classification (3) *Prereq: ENY 3005 or equivalent.* Classification of adult insects to family and selected economically important forms to species level. Habitat, niche, and relationship to environment.

ENY 6202C—Quantitative Approaches to Insect Ecology (3) *Prereq: ENY 6203 or equivalent and STA 6166 or equivalent.* Quantitative methods for describing and studying insect populations, computer simulation of insect-plant system dynamics, applications of modeling to insect ecology.

ENY 6203—Insect Ecology (4) *Prereq: PCB 3043 or 4044 or consent of instructor.* Special emphasis on evolutionary and population aspects. Discussions of primary literature; field projects.

ENY 6205—Nutritional Ecology of Insects (3) *Prereq: consent of instructor.* Relationships of morphological, physiological, behavioral, ecological, and evolutionary aspects of insect nutrition within basic and applied contexts.

ENY 6207C—Insect Population Dynamics (3) Characterization of insect population dynamics through use of population models.

ENY 6209—Insect Chemical Ecology (3) *Prereq: BCH 3023 or CHM 3210-3211 and ENY 3005 or ZOO 3203.* Analysis of various forms of chemical communication used by insects for survival; emphasis on use of these systems for control of pest species.

ENY 6261C—Insect Resistance in Crop Plants (3) Principles of plant resistance to insects.

ENY 6454—Behavioral Ecology and Systematics of Insects (3) Survey of concepts, theory, and practice of biosystematics, teleonomy, and cladistics.

ENY 6651C—Insect Toxicology (3) *Prereq: ENY 3005, organic chemistry or equivalent.* Chemistry, toxicity, mode of action, metabolism, and environmental considerations of insecticides and related compounds. Mechanisms of resistance to insecticides.

ENY 6665C—Advanced Medical and Veterinary Entomology I (4) *Prereq: ENY 4660 or 4161.* Taxonomy, morphology, and biology of arthropods of medical and veterinary importance. A collection and project proposal will be required.

ENY 6666C—Advanced Medical and Veterinary Entomology II (4) *Prereq: ENY 6665C.* Host parasite interactions, epidemiology, and methods of vector control. The course will include several overnight field trips. An original research project based on the proposal from ENY 6665C will be required.

ENY 6821—Insect Pathology (4) *Prereq: MCB 3013 or consent of instructor.* Interrelationship of insects and pathogenic microorganisms; history, classification, morphology, mode-of-action, and epidemiology of entomogenous bacteria, viruses, protozoa, and fungi.

ENY 6905—Problems in Entomology and Nematology (1-4; max: 12) Individual study under faculty guidance. Student and instructor to agree on problem and credits prior to registration. H.

ENY 6910—Supervised Research (1-5; max: 5) S/U.

ENY 6932—Special Topics in Entomology and Nematology (1-2; max: 4) Reports and discussions pertaining to selected topics announced in advance. S/U.
ENY 6934—Selected Studies in Entomology and Nematology (1-4; max: 8) Current issues. Subject matter variable, may be repeated with different subject each time.
ENY 6940—Supervised Teaching (1-5; max: 5) S/U.
ENY 6971—Research for Master's Thesis (1-15) S/U.
ENY 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.
ENY 7980—Research for Doctoral Dissertation (1-15) S/U.
NEM 5707C—Plant Nematology (3) Includes identification of plant parasitic nematodes, diseases they cause, interactions with other plant parasites, and management schemes to control population densities.
NEM 6101C—Nematode Morphology and Anatomy (2) *Prereq: NEM 3701 or equivalent.* Morphology, anatomy, and function of structures, organs, and systems.
NEM 6102C—Nematode Taxonomy and Systematics (3) *Prereq or coreq: NEM 6101C.* Collection, preparation, and identification of plant and soil nematodes; review of pertinent literature; drawing techniques and preparation of keys.
NEM 6201—Nematode Ecology (3) Population and community ecology of plant-parasitic and other soil-inhabiting nematodes. Mathematical descriptions and relationships will be emphasized where appropriate.
NEM 6708—Field Plant Nematology (2; max: 4) *Prereq: NEM 5707C or equivalent.* Field trips to various agricultural research stations and production areas in Florida to learn plant symptoms and current research methods.
NEM 6931—Nematology Seminar (1; max: 6) Presentation and discussion of current research, research topics. S/U option.
PMA 5205—Citrus Pest Management (3) *Prereq: ENY 3005 or equivalent.* Arthropod and nematode pests of citrus. Ecological principles of host and pest community relationships. Pest identification, biology, and interactions with citrus. Pest monitoring, diagnosis, and management.

ENVIRONMENTAL ENGINEERING SCIENCES
College of Engineering

GRADUATE FACULTY 1993-94

Chairman & Graduate Coordinator: J. J. Delfino. *Graduate Research Professor:* H. T. Odum. *Professors:* E. R. Allen; H. A. Bevis; G. Bitton; W. E. Bolch; T. L. Crisman; J. J. Delfino; B. Koopman; D. A. Lundgren; W. L. Miller; C. E. Roessler *(Emeritus);* W. Viessman, Jr.; J. Zoltek, Jr. *Scientist:* G. R. Best. *Associate Professors:* C. L. Montague; W. S. Properzio. *Associate Scientist:* M. T. Brown. *Assistant Professors:* M. D. Annadale; P. A. Chadik.

Graduate study is offered leading to the degrees Master of Engineering, Master of Science, Engineer, and Doctor of Philosophy in the field of environmental engineering and environmental sciences. Areas in which the student may specialize include air pollution, potable water supply systems, water pollution control, solid and hazardous waste, groundwater protection and remediation, environmental resources management, environmental biology, water chemistry, systems ecology and energy analysis, wetlands ecology and management, and health physics. The health physics speciality is offered through an interdepartmental program in cooperation with the Department of Nuclear Engineering Sciences (see the *Health Physics* description under *Interdisciplinary Graduate Studies*).

Direct admission into the Master of Science program requires a bachelor's degree in engineering or in a basic science such as chemistry, physics, biology, or mathematics. Persons with a degree in a nontechnical field may also be admitted into this program upon the completion of specified articulation.

Direct admission into the Master of Engineering program requires a bachelor's degree in engineering. Other persons wishing to enter this program will be required to take articulation work sufficient to bring their backgrounds into substantial agreement with those with undergraduate engineering training. The specific program of study must be approved by the student's supervisory committee.

It normally requires 16 to 24 months to complete the requirements for a master's degree. If articulation work is required, it may take longer, depending upon the student's background.

The following courses in related areas will be acceptable for graduate credit as part of the candidate's major:

Water Chemistry: CHM 5235, 5514, 6154, 6155, 6158C, 6165, 6430, 6440, 6449, 6710, 6720, CWR 5125, 5127, 6525, 6526, GLY 5241C, 5827, 6825, FOS 6355C, SOS 6414, 6448, 6622. *Health Physics:* ENU 5005, 5143, 5615L, 5424C, 5626, 6617, 6627, 6646, 6656L and 6657. *Systems Ecology and Energy Analysis:* FNR 5563, ECI 6636, GLY 5820, FOR 5625C, PCB 6307C, 6496C, BOT 6646C, PCB 5317C, GLY 6575, BOT 5695, 6356C, PCB 6447C, URP 6231, 6821, and AEB 6453.

CWR 6115—Surface Hydrology (3) *Prereq: MAP 3302 or EGM 3311, CWR 3201 or EGN 3353.* Occurrence and distribution of water by natural processes including atmospheric thermodynamics, precipitation, runoff, infiltration, water losses, flood routing and catchment characteristics, hydrograph analysis, and methods of runoff prediction. Current hydrologic computer models.
CWR 6117—Operational Hydrology (4) *Prereq: CWR 6115, STA 4321.* Stochastic hydrology. Probability and statistics applied to hydrologic problems. Synthesis of data. Correlation and spectral analysis. Box-Jenkins Modeling. Linear systems theory applications to hydrologic cycle components and rainfall-runoff processes. Hydrologic instruments and networks.
EES 5105—Environmental Biology (3) *Prereq: consent of instructor.* The role of microorganisms and other biota in major environmental problems, wastewater processes and natural bodies of water.
EES 5245—Water and Wastewater Analysis (3) *Prereq: CHM 2046.* Principles of analytical chemistry applied to the determination of chemical composition of natural waters and wastewaters. Emphasis on methods used in routine determinations of water and wastewater quality and interpretation of data.
EES 5305C—Ecological and General Systems (3) *Prereq: MAP 3302 or consent of instructor.* Systems ecology, including examples, languages, theoretical formulations and models for design, synthesis and prediction of systems of man and nature.
EES 5306—Energy Analysis (2) Energetics of systems of environment and economics; energy analysis of environmental systems, agroecosystems, regional and national economies; energy evaluation of public policy.
EES 5307—Ecological Engineering (2) Principles and practices in design and management of environment with society; systems concepts for organization of humanity, technology, and nature.

EES 5315—Ecology and the Environment (2) Application of ecological principles to environmental problems and management.
EES 5415—Environmental Health (3) Effects of environment pollution upon health. Methods of evaluation, treatment, and prevention of pollutants of health significance.
EES 6009—Ecological Economics (2) Consideration of new research areas; models and mathematical theories common to ecology and economics, interfaces between ecology and economics, relationships of energy and money.
EES 6036—Environmental Instrumentation (2) Basic instrumentation and instrumental techniques for the measurement of environmental parameters and pollutants.
EES 6135—Aquatic Microbiology (3) Behavior of microorganisms in freshwater, marine and soil environments. Stress of pollution on microbial communities. Adsorption of microorganisms to surfaces.
EES 6136—Aquatic Autotrophs (3) The function of algae and macrophytes in lake systems. Environmental problems associated with excessive growth of algae and macrophytes, and methods for their control.
EES 6137—Aquatic Heterotrophs (3) The role of zooplankton, benthic invertebrates and fish in freshwater systems. Emphasis is placed on trophic-level interactions, nutrient cycling and the potential of each group for predicting water quality.
EES 6207—Environmental Chemistry Principles II (3) *Prereq: CHM 2046.* Emphasis on chemical contaminants and their fate in the environment. The chemistry of treatment processes, organic chemistry, biogeochemistry, toxicology, and hazardous wastes.
EES 6208—Principles of Water Chemistry I (3) *Prereq: CHM 2046 or consent of instructor.* Application of chemical principles to aqueous reactions; emphasis on thermodynamics, kinetics, and aqueous equilibria including acid-base, solubility, complexation, precipitation and redox.
EES 6209—Principles of Water Chemistry II (3) *Prereq: EES 6208 or consent of instructor.* Application of chemical principles to reactions and composition of natural waters; emphasis on redox, chemical models, and fate of organic contaminants.
EES 6225—Atmospheric Chemistry (3) *Prereq: ENV 4101 or consent of instructor.* Nature, sources, and sinks of fixed and variable constituents of the atmosphere. Chemical changes occurring. Influences and properties of atmospheric components of natural and anthropogenic origin.
EES 6246—Advanced Water Analysis (3) *Prereq: EES 5245 or consent of instructor.* Advanced chemical procedures used in water chemistry research. Application of instrumental methods for determination of trace inorganic and organic natural water constituents.
EES 6301—Comparative Approaches in Systems Ecology (3) *Prereq: consent of instructor.* Alternative approaches for understanding ecological interactions, prediction after ecosystem perturbations, and optimal design with nature are evaluated within the context of natural selection and thermodynamics. Static, dynamic, deterministic, and stochastic study of energy flow, element cycling, and information feedback.
EES 6308C—Wetland Ecology (3) *Prereq: basic ecology or consent of instructor.* Defining and classifying major wetland ecosystems, formation of wetlands, wetland functions and values; wetlands ecological engineering and management; integrating wetlands into developing landscape. Emphasis on several field trips to natural and altered wetlands.
EES 6356—Estuarine Systems (3) Coastal ecosystems, their components, processes, systems, models and management including tropical, arctic and man-affected types, field trip and literature review.
EES 6405—Environmental Toxicology (3) *Prereq: basic biology or consent of instructor.* Effects of environmental toxicants on humans, animals, and the environment.
EES 6936—Water Science Seminar (1-4; max: 6) Chemical, physical and biological aspects of natural waters presented by area specialists and/or participating students.
EES 6xxxC—Environmental Systems Dynamics (3) *Prereq: COP 3210 or equivalent.* Feedback principles and methods introduced and used to develop and test hypothesis of causes of dynamics in an environmental system. Hypothesis tested through computer modeling.
ENV 5075—Environmental Policy (3) Policy analysis, policy making, and policy implementation. Analytical methods for evaluating alternative policies. Legal, social, political, and economic patterns and processes which shape the climate within which environmental policy is made.
ENV 5105—Introduction to Air Pollution (3) Principal types, sources, dispersion, effects, and physical, economic and legal aspects of control of atmospheric pollutants.
ENV 5206—Survey of Radiological Health (3) Oriented toward ENV majors not specializing in radiological health. Quantitative overview of radiation principles, sources, detection, measurement, and protection.
ENV 5306—Municipal Refuse Disposal (3) Quantities and characteristics of municipal refuse and hazardous materials. Collection methods, transfer stations, equipment and costs. Refuse disposal practices, regional planning and equipment.
ENV 5408—Case Studies in Water Treatment (3) *Prereq: knowledge of water treatment processes.* Review of water treatment plant process and design problems and development of solutions utilizing plant data.
ENV 5555—Wastewater Treatment (4) *Prereq: ENV 4514C or consent of instructor.* In depth study of the physical, chemical and biological processes utilized in the treatment of wastewater, with special emphasis on cause and effect of physical and biological actions.
ENV 5558C—Industrial Wastewater Treatment (3) *Prereq: ENV 4514C or 4531.* Generation and characteristics of industrial wastes. Treatment technology and process selection. Laboratory collection of design data, data interpretation, and report writing.
ENV 5930—Special Topics in Environmental Engineering I (1-4; max: 8) *Prereq: consent of instructor.* Laboratory, lectures or conferences covering specially selected topics.
ENV 6050—Pollutant Transport (3) *Prereq: MAP 3302 or EGM 3311, CWR 5201 or EGN 3353.* Distribution of pollutants in natural waters and the atmosphere. Advective and diffusive transport phenomena. Analytical and numerical prediction methods. Air and water quality models. Ocean outfall diffuser design.
ENV 6116C—Air Pollution Sampling Analysis (3) Determination of the concentration of normally encountered ambient pollutants. Practical experience in ambient air and indoor sampling.
ENV 6117C—Industrial and Occupational Air Sampling and Analysis (3) Selection, application, and operating principles of gas (air) sampling, measurement, and chemical analysis techniques used for determination/evaluation of industrial air pollutants, air toxics, and hazardous materials.
ENV 6125—Air Pollution Ventilation Design (3) Design of industrial ventilation systems to capture, transport and condition the hot, pollutant-laden, corrosive gases from industrial processes.
ENV 6126—Air Pollution Control Design (3) Design, analysis, operational limitations, cost and performance evaluation of control processes and equipment. Field visits to and inspection of industrial installations.
ENV 6130—Aerosol Mechanics (3) Generation, collection, and measurement of aerosols. Theory of the fluid dynamic, optical, electrical, inertial and thermal behavior of gas-borne particles.
ENV 6145—Environmental Meteorology (3) *Prereq: MAP 3302 or EGM 3311 and PHY 3048.* Dynamics and thermodynamics of the atmosphere related to environmental problems. Analysis of weather charts. Climatology. Ecological interactions. Diffusion, air pollution applications.
ENV 6146—Atmospheric Dispersion Modeling (3) Prediction of downwind pollutant concentrations from point, line, and area sources.
ENV 6215—Health Physics (3) *Prereq: ENV 6236 or 6051 or consent of instructor.* Techniques of hazard evaluation and radiation control; monitoring methods; survey techniques; biological sampling; instrument calibration; exposure standards and radiation protection regulation; on-site radiation safety surveys and evaluation.

ENV 6215L—Health Physics Measurements (2) *Prereq: ENV 6236 or ENV 5615/5615L or consent of instructor. Coreq: ENV 6215 or consent of instructor.* Lectures on applied measurement techniques in laboratory radiation protection. Air sampling and monitoring, personnel monitoring, bio-assay and in-vivo counting, ambient radiation monitoring, environmental radiation surveillance techniques, radon and radon daughter techniques, and nonionizing radiation.

ENV 6216—Radioactive Wastes (3) *Prereq: ENV 5206 or consent of instructor.* Source, treatment and disposal. Emphasis on prevention of environmental contamination.

ENV 6236—Radiological Techniques (4) *Prereq: ENV 5206 or consent of instructor.* Application to environmental engineering. Theory and operation of advanced protection instrumentation. Laboratory experiments on measurement and control of radionuclides in the environment.

ENV 6336—Hazardous Waste Management (3) *Prereq: CHM 2046.* Statutory and regulatory basis for hazardous waste management (RCRA). Development and evaluation of environmental regulation.

ENV 6435—Advanced Water Treatment Process Design (3) *Prereq: ENV 4514C, CHM 2046C, or consent of instructor.* Design of water treatment processes including air stripping disinfection, activated carbon adsorption, ion exchange, membrane processes, and ozonation. Predesign laboratory studies to select appropriate process parameters.

ENV 6437—Advanced Wastewater System Design (3) *Prereq: ENV 4501, 4514C or consent of instructor.* Layout and design of sanitary sewage systems, pumping stations, force mains, wastewater treatment plants, and methods of effluent disposal. Emphasis is placed on the preparation of design drawings and estimating costs.

ENV 6438—Advanced Potable Water System Design (3) *Prereq: ENV 4514C or consent of instructor.* Design of water treatment operations, including coagulation, flocculation, mixing, sedimentation, filtration, softening, corrosion control, and sludge management. Design costs.

ENV 6510—Groundwater Restoration (3) *Prereq: consent of instructor.* Design of water treatment systems employing aeration, activated carbon, reverse osmosis, and in situ bioremediation to restore contaminated groundwater.

ENV 6511—Biological Wastewater Treatment (3) *Prereq: consent of instructor.* Theory and current research associated with biological treatment processes.

ENV 6556—Advanced Waste Treatment Operations (3) *Prereq: ENV 5555.* Biological, physical, and chemical processes used in the advanced treatment of domestic and industrial wastewater. Reuse application and guidelines.

ENV 6606—Environmental Resources Engineering (3) Standards and criteria for evaluation of environmental resources projects. Formulation of mathematical models for environmental problems. Application of economics and operations research as aids in decision making.

ENV 6656—Urban Environmental Engineering (3) Overall problem of developing and maintaining high quality physical environment in urban areas. Integrative approach to air, land, and water quality management problems.

ENV 6905—Individual Work (1-4; max: 8) Faculty-supervised individual research or study of material not covered in formal courses.

ENV 6910—Supervised Research (1-5; max: 5) S/U.

ENV 6916—Nonthesis Project (1-2; max: 2)

ENV 6932—Special Problems in Environmental Engineering (1-4; max: 8)

ENV 6935—Graduate Environmental Engineering Seminar (1; max: 6) S/U option.

ENV 6940—Supervised Teaching (1-5; max: 5) S/U.

ENV 6971—Research for Master's Thesis (1-15) S/U.

ENV 6972—Research for Engineer's Thesis (1-15) S/U.

ENV 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.

ENV 7980—Research for Doctoral Dissertation (1-15) S/U.

EXERCISE AND SPORT SCIENCES
College of Health and Human Performance

GRADUATE FACULTY 1993-94

Chairman: R.N. Singer. *Graduate Coordinator:* N.S. Whiddon. *Distinguished Service Professor:* R. H. Alexander. *Professors:* P. J. Bird; O. J. Holyoak; D. A. Kaufmann; H. A. Lerch; M. L. Pollock; S. K. Powers; R. N. Singer; P. D. Welch; N. S. Whiddon. *Associate Professors:* J. A. Cauraugh; S. L. Dodd; M. Murphey; R. A. Siders; C. B. Stopka; L. K. Tennant. *Assistant Scientist:* W. F. Brechue.

Programs leading to the degrees Master of Science in Exercise and Sport Sciences and Master of Exercise and Sport Sciences are offered through the Department. Areas of specialization for the master's program include athletic training, exercise physiology, motor behavior (sport psychology or motor learning), special physical education, sports administration, pedagogy in physical education, and wellness. For each area, there are selected courses from other departments which are accepted in meeting degree requirements.

The Master of Science in Exercise and Sport Sciences degree program provides the student with an opportunity to study, conduct research, and prepare a thesis in an area of special interest. The Master of Exercise and Sport Sciences degree program offers the student a beginning specialization in a selected area of study, with additional work in other areas. A comprehensive written and oral examination is required for this degree.

The Ph.D. program is offered through the College of Health and Human Performance with tracks in exercise physiology and motor behavior. These interdisciplinary specializations blend concentrated course work with research.

Exercise Physiology.—The Ph.D. track in exercise physiology is designed to train individuals for careers in research and teaching in an academic setting. A strong emphasis is placed on laboratory and research experience as well as course work and training. Primary course work and training will include cardiovascular, respiratory, metabolic and strength physiology, and body composition.

Motor Behavior.—Due to the interdisciplinary nature of this field, the doctoral program draws upon experiences in the Department of Exercise and Sport Sciences and in such specializations as cognitive psychology and psychobiology. Students will be prepared to undertake research in educational, athletic, industrial, and military settings, as well as to instruct and provide expertise in these same settings.

HLP 6515—Evaluation Procedures in Health and Human Performance (3) Evaluation and interpretation of tests and analysis of research data.

HLP 6535—Research Methods (3) Introduction to research methodology and design.

HLP 6911—Research Seminar (1; max: 6) Research presentations by graduate students and faculty in the College of Health and Human Performance. S/U.

HPL 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have

been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.

HLP 7980—Research for Doctoral Dissertation (1-15) S/U.

PET 5216—Sport Psychology (3) *Prereq: permission of instructor.* Survey of current research, learning processes, motivation, performance intervention, strategies, group dynamics, history of sport psychology, and other topics.

PET 5389—Assessment in Exercise Science (3) *Prereq: PET 3351 or equivalent.* Techniques and methodologies to assess health and physical fitness.

PET 5465—Sport Finance and Marketing (3) *Prereq: MAR 3023, PET 4423, and 6476.* Financial theories and practical applications of sport income and expenditures and principles and procedures of marketing sport in today's society.

PET 5655C—Advanced Special Physical Education (3) *Prereq: PET 3640 or equivalent.* Teaching physical education to the physically and mentally disabled populations.

PET 5936—Current Topics in Exercise and Sport Sciences (1-5; max: 5) *Prereq: permission of department chairman.* Offered, upon request of students, to meet special interests inadequately covered in other courses.

PET 6015—Interpretation of Exercise and Sport Sciences (3) Biological, physiological, sociological, and educational implications needed to interpret the function of physical education in contemporary democratic society.

PET 6087—Theoretical and Research Bases for Programs (3) Application of current knowledge related to establishment of curricula in exercise and sport sciences.

PET 6136—Modern Olympic Games (3) Contemporary issues such as commercialism, professionalism, politics, performance enhancement, cultural influences, and leaders in Olympic movement.

PET 6137—Sport in the Twentieth Century (3) Historical survey of sport in America during the twentieth century.

PET 6206—Youths in Sport (3) Influence of sport experiences on development of youths and major psychological, physiological, sociological, and moral considerations surrounding youth involvement in sport.

PET 6218—Planning Motor Actions (3) *Prereq: permission of instructor.* Processes and mechanisms involved in planning voluntary human motor actions. Variables that influence movement planning and initiation.

PET 6228—Controlling Motor Actions (3) Analysis of human voluntary motor actions, including mechanisms and systems involved in motor control.

PET 6235C—Nature and Bases of Motor Performance (3) Principles relating to development of motor skill, with emphasis on conditions affecting its development and retention in physical education activities.

PET 6346C—Biomechanics of Human Motion (3) *Prereq: PET 3320; MGF 1113 or MAC 1132.* Application of principles of statics, kinematics, and kinetics to kinesiological systems of the human body in movement and sports skills.

PET 6355C—Physiological Bases of Exercise and Sport Sciences (3) Application of fundamental concepts of human physiology to programs of physical education and sports. Recent research developments in sports physiology.

PET 6356L—Practicum in Exercise Physiology (3) *Prereq: PET 6355C.* Applied and experimental work emphasizing practical problems.

PET 6476—Sport and Fitness Management (3) Management of intercollegiate/interscholastic athletic programs, campus recreation, and health/fitness programs.

PET 6478—Issues in Sport Law (3) Legal effects of regulating and managing amateur and professional sports and wellness programs: injury liability, risk management, constitutional rights of athletes, and contract negotiation.

PET 6615—Assessment and Curriculum Techniques in Special Physical Education (3) Evaluating and teaching physical education to exceptional populations and administration of various assessment and curriculum instruments.

PET 6616—Physical Assessment of Athletic Injuries (3) *Designed for students who are NATA certified trainers.* Identification, evaluation, and management of acute athletic injuries.

PET 6627—Rehabilitation and Modalities of Athletic Injuries (3) *Prereq: PET 4622 or equivalent.* Rehabilitation and therapeutic modalities in the field of athletic training. H.

PET 6636—Anatomy and Pathophysiology in Athetlic Training (3) *Prereq: PET 6616 or permission of instructor. Designed for students who are NATA certified trainers.* Understanding and treating athletic injuries.

PET 6666—Educational and Administrative Aspects of Athletic Training (3) *Prereq: PET 4622. Designed for students who are NATA certified athletic trainers.* Understanding and application of appropriate educational techniques and administrative procedures in athletic settings.

PET 6905—Directed Independent Study (1-5; max: 9) Individual research projects under faculty guidance.

PET 6910—Supervised Research (1-5; max: 5) S/U.

PET 6933—Seminar in Athletic Training (1-5; max: 5) *Prereq: NATA certification.* Research topics or contemporary issues in athletic training.

PET 6934—Seminar in Special Physical Education (2; max: 4) Theory and practical experience in the field of special physical education.

PET 6937—Seminar in Sport Psychology: Current Topics (3) *Prereq: sport psychology course or permission of instructor.* Discussion of research topics, including contemporary issues and interests. In-depth exploration of research and theory. Citation of practical sport setting applications where appropriate.

PET 6940—Supervised Teaching (1-5; max: 5) S/U.

PET 6948—Advanced Practicum in Exercise and Sport Sciences (1-5; max: 5) Internship experience related to the student's area of specialization.

PET 6971—Research for Master's Thesis (1-15) S/U.

PET 7365—Cardiovascular Exercise Physiology (3) *Prereq: PET 6355C, 6356L or equivalent.* Basic mechanisms of cardiovascular dynamics at rest and in response to exercise.

PET 7366—Pulmonary Function During Exercise (3) *Prereq: PET 6355C or equivalent.* Regulation of pulmonary gas exchange during exercise; acute and experimental procedures during exercise.

PET 7368—Exercise Metabolism (3) *Prereq: PET 6355C or equivalent.* Principles of metabolic regulation during exercise; effects of chronic exercise on muscle metabolism.

PET 7386—Environmental Stress Exercise Physiology (3) *Prereq: PET 6355C, 6356L or equivalent.* Energetics of environmental stress on cardiovascular, respiratory, metabolic, and muscle physiology as they pertain to physical performance.

FINANCE, INSURANCE, AND REAL ESTATE

College of Business Administration

GRADUATE FACULTY 1993-94

Chairman: H. C. Smith. *Graduate Coordinator:* M. J. Flannery. *Graduate Research Professors:* E. F. Brigham; H. Levy. *Barnett Banks Eminent Scholar:* M. J. Flannery. *Sun Bank Eminent Scholar:* C. M. James. *William H. Dial Professor of Finance:* A. A. Heggestad. *Professors:* R. L. Crum; J. Kraft; M. B. Livingston; W. A. McCollough; D. J. Nye; H. C. Smith. *Associate Professors:* D. T. Brown; D. C. Ling; R. C. Radcliffe; M. D. Ryngaert; *Assistant Professors:* W. R. Archer; A. S. Desai; J. F. Houston; R. M. Mooradian; S. Venkataraman. *Lecturer:* T. C. Tapley.

The Department of Finance, Insurance, and Real Estate offers graduate courses leading to the Master of Arts (M.A.) and the Doctor of Philosophy (Ph.D.) in business administration. Both degrees are offered with a concentration in either finance or real estate. In addition, a nonthesis M.A. is available in the real estate track which fulfills the educational requirements of the Appraisal Institute for the MAI designation. Both finance and real estate are also available as concentrations within the MBA program.

The Ph.D. program has a strong emphasis on scholarly research training. Admission requirements include (a) minimum grade point average of 3.5 in the last two years of an undergraduate program and in any previous graduate-level work, (b) minimum GRE score of 1300 or GMAT score of 600 (both verbal and quantitative scores must exceed the sixtieth percentile), and (c) (for nonnative speakers of English) a minimum score of 550 on the TOEFL. Generally students will not be admitted to the Ph.D. program unless they have been offered financial assistance by the University.

The Department does not encourage application to the M.A. (thesis option) program, but unusual situations will be considered on a case-by-case basis.

Detailed information about the finance and real estate concentrations is provided below. For information about the MBA program, please consult that listing in the *General Information* section.

Finance.—The student pursuing a concentration in finance typically specializes in financial management, financial markets and institutions, or investments. The Ph.D. curriculum consists of course work of four types: research foundations, the major field, a minor or supporting field, and a breadth requirement.

The research foundation requirements are comprised of a set of six courses: ECO 6115—Microeconomic Theory I, ECO 6206—Macroeconomic Theory I, ECO 6805—Mathematical Methods and Applications to Economics, STA 4321 and 4322—Mathematical Statistics I and II, and at least one econometrics course suitable for the student's backgound and proposed thesis research.

The major field in finance consists of at least 16 credit hours in graduate course work in finance including FIN 6446 and 6447—Financial Theory I and II. Students may elect to have one "strong" minor (16 credit hours), two "weak" minors (8 credit hours each), or a supporting field which is not declared as a minor. If a supporting field is chosen, at least 16 hours of course work acceptable to the student's supervisory committee must be taken. The supporting field option is selected when a student wishes to take courses across a number of departments.

The breadth requirement applies only to students with no prior course work in business and consists of ACG 6065—Financial and Managerial Accounting or its equivalent, plus two of the following: ECP 6705—Economics of Business Decisions, MAN 5501—Operations Management, or MAR 6805—Problems and Methods in Marketing Management. Other requirements are listed in the *General Information* section of this *Catalog*.

Real Estate.—The research foundations are identical to those listed above for finance. The major field, minor, and supporting field requirements have the same credit stipulation as those outlined above for finance, except that the major work is in real estate.

The breadth requirement, as in all concentrations for the business administration program, applies only to students entering without prior course work in business. It consists of at least three courses from the following list (two or more fields must be represented): GEB 5405—Legal Environment of Business, FIN 5405—Financial Management, FIN 5525—Security Markets and Pricing, FIN 6246—Money and Capital Markets, MAR 6805—Problems and Methods of Marketing Management, MAR 6506—Consumer Behavior, and ACG—Financial and Managerial Accounting.

The M.A. with a concentration in either finance or real estate requires a minimum of 30 credit hours which includes a minor of at least 6 credits and a thesis. No more than 6 hours of FIN or REE 6971 count toward the 30 credit minimum.

The M.A. nonthesis option emphasizing appraisal for the concentration in real estate is a two-year program consisting of at least 36 credits of letter-graded courses and 6 credits of off-campus internship. This program meets all of the education requirements and some of the experience requirements for the MAI designation awarded by the Appraisal Institute. A narrative demonstration report is also required.

FIN 5405—Business Financial Management (3) *Prereq: ACG 6065, QMB 5305. Required of all MBA degree candidates who have had no basic business finance course.* Analysis of business financing and investing decisions.

FIN 5425—Corporation Finance (3) *Prereq: FIN 4414, 5405, or consent of instructor.* The application of business finance problems. Students prepare written solutions to case problems.

FIN 5525—Security Markets and Pricing (3) *Prereq: FIN 5405 or consent of instructor.* An examination of security market structure and the theory of security selection and pricing.

FIN 6246—Money and Capital Markets (4) *Prereq: FIN 5405, college-level mathematics, and statistics.* Financial markets, with emphasis on flow of funds, interest rate determination, and allocation of resources.

FIN 6314—Financial Institutions (3) *Prereq: FIN 5405. Designed for MBA candidates.* Description and analysis of management decisions in a changing economic and regulatory environment.

FIN 6446—Financial Theory I (4) *Prereq: FIN 5405 or consent of instructor.* The first in a two-course sequence. Emphasis on the theory of the firm's investment and financing decisions.

FIN 6447—Financial Theory II (4) *Prereq: FIN 6446 or consent of instructor.* Emphasis on the theory of the financial intermediary system.

FIN 6626—International Finance (4) *Prereq: FIN 5405 or consent of instructor.* A study of international financial markets and institutions, and problems encountered by corporations operating in the international environment.

FIN 6905—Individual Work in Finance (1-4; max: 7) *Prereq: permission of department and Director of Graduate studies.* Reading and/or research in finance as needed by graduate students.

FIN 6940—Supervised Teaching (1-5; max: 5) S/U.

FIN 6957—International Studies in Finance (1-4; max: 12) *Prereq: admission to approved study abroad program and permission of department.* S/U.

FIN 6971—Research for Master's Thesis (1-15) S/U.

FIN 7808—Corporate Finance (4) *Prereq: FIN 6446, 6447 or consent of instructor.* Theory and empirical analyses of corporate financial decisions in a world of risk with both perfect and imperfect markets.

FIN 7809—Investments (4) *Prereq: FIN 6446, 6447 or consent of instructor.* Theory and empirical analyses of security investment decisions in a world of risk with both perfect and imperfect markets.

FIN 7810—Financial Markets and Institutions (4) *Prereq: FIN 6446, 6447 or consent of instructor.* The economic role of financial markets and institutions and how financial decisions are made by financial institutions.
FIN 7938—Finance Research Workshop (1-4; max: 7) Analysis of current research topics. Paper presentation and critiques by doctoral students, faculty, and visiting scholars.
FIN 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.
FIN 7980—Research for Doctoral Dissertation (1-15) S/U.
REE 5145—Case Studies in Valuation Analysis and Report Writing (3) Analysis of various property types and appraisal situations. Case studies illustrate and teach application of appraisal methodology to typical assignment.
REE 5505—Real Estate Development and Management (3) The decision making process concerning the production and management of real estate resources. Includes principles and techniques employed by developers and managers, as well as case studies of real estate projects.
REE 6196—Seminar in Real Estate Valuation (3) Advanced theories and methods of appraisal. Statistical inference, market simulation, and application of specialized appraisal theory to appraisal problems.
REE 6286—Seminar in Real Estate Financial Analysis (3) Mortgage risk analysis, mortgage risk rating; trading on equity; long- and short-term financing; problems encountered in slum clearance, subdivision, and urban redevelopment.
REE 6395—Seminar in Real Estate Investment and Development (3) Advanced theory and applications of real estate investment analysis to both existing properties and new development. Emphasis on problem identification, analysis and prospective solutions.
REE 6796—Seminar in Real Estate Market Analysis (3) Economic factors which provide the basis for urban growth and development. Analysis of real estate supply and demand with applications to residential and nonresidential markets.
REE 6905—Individual Work in Real Estate (1-3; max: 7) *Prereq: permission of department and Director of Graduate Studies.* Reading and/or research in real estate.
REE 6910—Supervised Research (1-5; max: 5) S/U.
REE 6940—Supervised Teaching (1-5; max: 5) S/U.
REE 6946—Internship (1-3; max: 10) *Prereq: at least one semester of graduate work in real estate.* Work experience in a real estate office for graduate students who intend to become professional appraisers and analysts. S/U.
REE 6957—International Studies in Real Estate (1-4; max: 12) *Prereq: admission to approved study abroad program and permission of department.* S/U.
REE 6970—Appraisal Demonstration Report (6) A major work requiring students to integrate knowledge and analytical tools developed through course work and internship. Substantial research effort comprising market data collection and analysis undertaken during internship. Required for nonthesis option. H.
REE 6971—Research for Master's Thesis (1-15) S/U.
REE 7920—Real Estate Research Workshop (3; max: 6) Analysis of current research topics. Paper presentation and critiques by doctoral students, faculty, and visiting scholars.
REE 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.
REE 7980—Research for Doctoral Dissertation (1-15) S/U.
RMI 6195—Seminar in Life Insurance (3) *Prereq: RMI 4135.* Problems in life insurance and related fields.
RMI 6296—Seminar in Property and Liability Insurance (3) *Prereq: RMI 3206, 3207.* Meaning, economic influences, social values, principles, and practices of property and liability insurance.
RMI 6905—Individual Work in Risk Management and Insurance (1-4; max: 7) *Prereq: permission of department and Director of Graduate Studies.*
RMI 6910—Supervised Research (1-5; max: 5) S/U.
RMI 6936—Problems in Risk Management (3) Insurance hazards of business concerns and governmental units, with consideration of insurance protection available.
RMI 6957—International Studies in Insurance (1-4; max: 12) *Prereq: admission to approved study abroad program and permission of department.* S/U.
RMI 6971—Research for Master's Thesis (1-15) S/U.
RMI 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.
RMI 7980—Research for Doctoral Dissertation (1-15) S/U.

FOOD AND RESOURCE ECONOMICS
College of Agriculture

GRADUATE FACULTY 1993-94

Chairman: L. W. Libby. *Graduate Coodinator:* R. L. Kilmer. *Graduate Research Professor:* U. Lele. *Distinguished Service Professors:* C. G. Davis; K. W. Kepner. *Professors:* J. Alvarez; C. O. Andrew; R. P. Beilock; W. G. Boggess; R. R. Carriker; J. C. Cato; R. L. Clouser; R. L. Degner, J. K. Dow; H. E. Drummond; R. D. Emerson; G. F. Fairchild; C. H. Gladwin; J. R. Gordon; P. E. Hildebrand; J. Holt; C. F. Kiker; R. L. Kilmer; M. R. Langham; J. Y. Lee; L. W. Libby; B. F. Long; G. D. Lynne; J. W. Milon; W. D. Mulkey; L. C. Polopolus; J. E. Reynolds; J. R. Simpson; T. H. Spreen; T. G. Taylor; K. R. Tefertiller; R. W. Ward; P. J. van Blokland; J. J. VanSickle. *Associate Professors:* C. M. Adams; R. M. Behr; M. G. Brown; R. J. Burkhardt; D. A. Comer; J. J. Haydu; C. B. Moss; M. T. Olexa; J. L. Seale; D. A. Zimet. *Assistant Professor:* R. N. Weldon.

The degrees of Master of Agricultural Management and Resource Development (nonthesis), Master of Science (thesis and nonthesis option), and Doctor of Philosophy are offered. Areas of specialization include agricultural business management, marketing, production, economic development, econometrics, and resource and environmental economics. The Department participates in the programs of the Centers for Latin American Studies, African Studies, Tropical Agriculture, and Environmental Programs, and the Florida Sea Grant College Program.

Students who hold a bachelor's degree with their major fields of study in areas other than food and resource economics should consult with the Graduate Coordinator concerning acceptance for graduate study.

In addition to the courses listed, there are seminars for organized discussion of current topics and for review of graduate student's research.

AEB 5316—Using Futures and Options (3) Hands on approach to using futures and options in business as hedges or speculators. Examples in agricultural, interest rate, currency, index, metal, and petroleum futures. Market trading.
AEB 6106—Microeconomic Principles and Analysis (3) *Prereq: ECO 3101 and AEB 4511 or equivalents.* Economics as a behavioral science describing actions of consumers and producers interacting in the market process; welfare economics; property

rights; competition and equilibrium. Institutional backdrop for market process. Problem solving using economic principles.

AEB 6145—Agricultural Finance (3) *Prereq: ECO 3101* Principles of firm financial management, financial markets, financial institutions, capital markets, firm growth, and analysis. Emphasis on markets and application of financial principles.

AEB 6182—Agricultural Risk Analysis and Decision Making (3) *Prereq: AEB 6106 or equivalent.* Review of conceptual framework and research methods for analysis of decision-making by agricultural producers. Expected utility theory, risk programming, stochastic dominance, and dynamic decision models.

AEB 6184—Economics of Agricultural Production (3) *Prereq: AEB 4511, 6182.* Producer decisions including theoretical and empirical problems of multifactor, multiproduct, and poly-period cases. Input demand and product supply functions at the commodity and industry levels.

AEB 6186—Advanced Topics in Agricultural Production Economics (3) *Prereq: AEB 6184.* Frontiers in theoretical and applied production economics.

AEB 6252—Foundations of Food and Resource Economics (3) Philosophy of science underlying economics; historical influences on agricultural economics; role of food and resource economics in understanding and influencing agricultural and resource practices and policies.

AEB 6263—Agricultural Policies and Programs (3) *Prereq: ECO 3203.* Distributional aspects of economic policy. Effects of policies on output, prices, and income. Theories of policy formation.

AEB 6299—Benefit-Cost and Social Impact Analysis (3) *Prereq: AEB 6106, ECO 6115.* Introduction to theory and practice. Application to agricultural, environmental, and international development problems.

AEB 6363—Intermediate Consumption Economics and Agricultural Marketing (3) *Prereq: ECO 3101.* Consumer choice and demand; form, temporal, and spatial dimensions of prices and product distribution.

AEB 6373—Consumption and Demand (3) *Prereq: AEB 4511, 6363 or ECO 3101.* Theory of consumer behavior and its uses in economic analysis. Development of duality concepts, theory of inverse demand, separability, aggregation, and household expenditure analysis.

AEB 6383—Industrial Organizations of Agricultural Markets (3) *Prereq: ECO 3100 or 3101.* Market structure, conduct, and performance. Evaluation of current public policy and institutional arrangements.

AEB 6384—Marketing Economics in Agriculture (3) *Prereq: ECO 3101.* Theoretical concepts and mathematical models of economic efficiency. Evaluate impacts of firm and industry organization, information, grades and standards, storage and vertical coordination on economic efficiency.

AEB 6385—Management Strategies for Agribusiness Firms (3) *Prereq: ECO 3101.* Planning, organizing, implementing, and evaluating the agribusiness management functions of strategic planning, finance, marketing, and personnel.

AEB 6453—Natural Resource and Environmental Economics (4) *Prereq: ECO 3101 and 3203, or consent of instructor.* Resource use, management, development, and conservation. Institutional and market performance in providing socially desired outcomes.

AEB 6483—Seminar in Natural Resource and Environmental Economics (3) *Prereq: AEB 6453.* Application of economic methods to problems of environmental and regional development; input-output models, cost-benefit analysis, economic valuation, and development planning.

AEB 6533—Static and Dynamic Optimization Models in Agriculture (4) *Prereq: ESI 4567.* Classical optimization models with emphasis on mathematical programming and applications. Introduction to dynamic optimization models.

AEB 6553—Elements of Econometrics (3) *Prereq: AEB 3103, 4511; STA 3023.* Econometric problem solving and determining quantitative relationships among economic variables in agriculture and related industries.

AEB 6571—Econometric Methods I (4) *Prereq: MAS 3113, STA 4322.* Linear and nonlinear econometric models, serial correlation, heteroscedasticity, errors in variables, qualitative variables, specification errors, and simultaneous equation models.

AEB 6572—Econometric Methods II (4) *Prereq: AEB 6571.* Topics in econometrics including single equation and multiple equation linear and nonlinear models.

AEB 6592—Mathematical Programming for Economic Analysis (3) *Prereq: AEB 4511.* Simplex method and primal-dual relationships in linear programming. Application of modeling techniques, such as separable, multi-objective, quadratic, and integer programming, to economic problems.

AEB 6612—International Agricultural Development Planning (3) Theory and practice of agricultural planning for developing countries. Economic analysis of agricultural projects and policies. Practical approaches relevant to policy making.

AEB 6634—Agricultural Development Administration (3) Administration of public agricultural research and extension systems for developed and developing countries.

AEB 6645—Economic Development and Agriculture (3) *Prereq: ECO 3202, 3100, or AEB 3103.* Relation of human, capital, and natural resources, technology, and institutions to income growth and distribution. Development strategies in low-income countries.

AEB 6651—Agriculture's Role in Latin America and Africa (3) Socioeconomic development and strategies at the national, regional, and village level. Underdevelopment and cultural ecology.

AEB 6674—International Agricultural Trade and Policy (3) *Prereq: AEB 4511, ECO 3703.* Trade theory applied to international policies, agreements, and programs.

AEB 6676—International Agricultural Finance and Policy (3) *Prereq: ECO 3703, AEB 4511.* International financial institutions, markets, and policies; their effects upon the agricultural sector.

AEB 6727—Rural Welfare and Development Policy (3) *Prereq: ECO 4203, 4101.* Underdevelopment in the U.S. within a historical framework. Nature and consequences of levels of human and nonhuman investment in a dynamic setting.

AEB 6815—Science and Research Methodology (2) Role of science, philosophy, and scientific methods in food and resource economics research.

AEB 6905—Problems in Food and Resource Economics (1-3; max: 8) Individual study. Problems of interest to the student and agreeable to the instructor.

AEB 6910—Supervised Research (1-5; max: 5) S/U.

AEB 6933—Special Topics (1-6; max: 6) *Prereq: consent of instructor.*

AEB 6940—Supervised Teaching (1-5; max: 5) S/U.

AEB 6971—Research for Master's Thesis (1-15) S/U.

AEB 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.

AEB 7980—Research for Doctoral Dissertation (1-15) S/U.

AGG 5813—Farming Systems Research and Extension Methods (3) Multidisciplinary team approach to technology generation and promotion with emphasis on small farms. Adaptations of anthropological, agronomic, and economic methods. Field work required.

FOOD SCIENCE AND HUMAN NUTRITION
College of Agriculture

GRADUATE FACULTY 1993-94

Chair: D. L. Archer. *Graduate Coordinator:* R. P. Bates. *Boston Family Professor of Human Nutrition:* R. J. Cousins. *Professors:* L. B. Bailey; R. P. Bates; P. R. Borum; R. J. Braddock; C. Chen; J. F. Gregory III; J. A. Lindsay; M. R. Marshall; R. F. Matthews; H. A. Moye; W. S. Otwell; G. E. Rodrick; R. L. Rouseff; R. H. Schmidt; R. B. Shireman; H. S. Sitren; A. A. Teixeira; N. P. Thompson; C. I. Wei; R. L. West; W. B. Wheeler. *Associate Professors:* M. O. Balaban; L. B. Bobroff; R. D. Brown, Jr.; M. E. Parish; R. C. Robbins; C. A. Sims; M. L. Tamplin; P. A. Wagner. *Associate Scientist:* J. P. Toth. *Assistant Professors:* L. K. Guyer; G. P. A. Kauwell; S. F. O'Keefe; S. S. Percival.

Programs leading to degrees of Master of Agriculture, Master of Science, and Doctor of Philosophy are offered. Students in the Ph.D. program may specialize in either food science or nutritional sciences. An American Dietetics Association Approved Preprofessional Practice Program

(AP4), leading to ADA registration, is also available as part of a master's degree program. Areas of expertise include nutritional biochemistry and nutritional assessment, dietetics, food chemistry, food processing, food microbiology, and food toxicology and safety. In addition, a student can pursue a graduate specialization in food engineering through a cooperative program administered by the Departments of Food Science and Human Nutrition and Agricultural Engineering.

Research within areas of specialization includes nutrient function and metabolism, nutritional status, food product and process development, food chemistry and analytical methodology, food quality, food microbiology, seafood technology, citrus processing, toxicology, and the metabolism and analysis of pesticide residues in plant and animal tissues.

Students in the nutritional sciences specialization as well as certain students in the food science area must complete a specific core of courses. In the M.S./AP4 program the affiliates are located within a 45-mile radius of Gainesville. Students in the AP4 must sign waivers of liability for travel and clinical practice upon entering the program. Students are eligible for the registration examination when the AP4 has been completed.

Students should have sufficient background in physical and biological sciences, and food science or nutrition. Students with inadequate backgrounds will be required to take prerequisite subjects without credit toward their graduate degrees.

DIE 6905—Problems in Dietetics (1-2; max: 4) *Not open to students on probation or conditional admission.* Individual study and research carried out in community, hospital, or laboratory settings.

DIE 6941—Introduction to Clinical Practice (2) Nutritional, assessment, enteral and parenteral nutrition, diet therapy, patient assessment, nutrition care plans, patient interview, and diet counseling.

DIE 6942—Approved Preprofessional Practice in Dietetics (1-12; max: 18) Practicum in dietetics in affiliated institutions offering clinical dietetics, food service systems management, and community nutrition.

FOS 5225C—Principles in Food Microbiology (4) *Prereq: MCB 3020 or consent of instructor.* Fundamental aspects of biological contamination and its control during harvesting, processing, and storage of foods. Analysis of microbial food fermentation, microbial ecology of foods, selection of methods to examine foods for microbial content.

FOS 5561C—Citrus Processing Technology (3) *Prereq: undergraduate course in food processing.* Grading, inspection, sampling, extraction and concentration of citrus products emphasizing manufacturing and quality assurance.

FOS 6126C—Psychophysical Aspects of Foods (3) *Prereq: FOS 4311C and 4722C.* Physical and chemical stimuli controlling human sensory perception of texture, color, and flavor of foods.

FOS 6226C—Advanced Food Microbiology (4) *Prereq: FOS 4222/4222L or 5225, MCB 4303/4303L and BCH 6415 or BMS 6352C.* Selection of laboratory methods, characterization of food-borne pathogens and spoilage organisms.

FOS 6235—Food Toxicology and Food-Borne Infections (3) *Prereq: HUN 3246 or consent of instructor.* Study of the toxic materials occurring in food and the chemical/biological properties of these toxicants. Study of the food-borne infectious diseases, the mechanisms of disease transference, and pathogenesis.

FOS 6236—Biochemical Toxicology (3) *Prereq: CHM 3211, HUN 3246 or equivalent.* Physiochemical mechanisms of cellular toxicity induced by organic chemicals.

FOS 6315C—Advanced Food Chemistry (4) *Prereq: BCH 4024 or HUN 3246 and FOS 4311C.* Functions of lipids, carbohydrates, proteins, enzymes and other components in foods and their reactions and interactions during food processing and storage.

FOS 6355C—Instrumental Analysis and Separations (5) *Prereq: CHM 3120, FOS 4311C.* Separation of food chemicals; gas, high performance liquid, thin-layer, ion-exchange and molecular size chromatography; characterization via UV-visible, IR, NMR, and mass spectrometry.

FOS 6428C—Advanced Food Processing (4) *Prereq: MAG 4062, FOS 4427C.* Reaction kinetics, heat transfer mechanics, and process design, optimization and economics.

FOS 6455C—Industrial Food Fermentations (3) *Prereq: FOS 4222C.* Microbiological, chemical, and physical principles in fermentation of foods and constituents, including single cell protein production.

FOS 6646C—Proteins and Enzymes in Food Systems (4) *Prereq: FOS 6315C.* Structure, function, and analytical techniques for proteins and enzymes in food systems.

FOS 6648—Carbohydrates in Food Systems (2) *Prereq: FOS 6315C or equivalent.* Structure, physical and chemical properties of carbohydrates, and their analysis, function, and reactivity in food systems.

FOS 6649—Food Lipids and Flavor Chemistry (2) *Prereq: FOS 6315C or equivalent.* Structure, physical and chemical properties of lipids and flavor components; their analysis, function, and reactivity in food systems during processing and storage.

FOS 6905—Problems in Food Science (1-2; max: 4) *Not open to students on probation or conditional admission.* Individual study carried out in laboratory, library, pilot plant, or the food industry. H.

FOS 6910—Supervised Research (1-5; max: 5) S/U.

FOS 6915—Research Planning (2) *Required of first-year graduate students.* Planning and initiating research, experimental techniques, analysis of data, reporting of results.

FOS 6936—Topics in Food Science (1-3; max: 8) Special aspects or current developments in food science.

FOS 6938—Food Science Seminar (1; max: 2) Preparation and presentation of reports on specialized aspects of research in food science.

FOS 6940—Supervised Teaching (1-5; max: 5) S/U.

FOS 6971—Research for Master's Thesis (1-15) S/U.

FOS 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.

FOS 7980—Research for Doctoral Dissertation (1-15) S/U.

HUN 6245—Advanced Human Nutrition (3) *Prereq: BCH 4024 or HUN 3246, and a nutrition principles course.* Ingestion, digestion, absorption, transport, metabolism, and excretion of nutrients; metabolic and neuroendocrine controls.

HUN 6249—Recent Advances in Human Nutrition (1; max: 3) Informal critical discussion of selected areas. Current theories and controversies, research approaches, and nutrition policies. S/U option.

HUN 6255—Clinical Nutrition (4) An integrated presentation of nutritional requirements and metabolism of nutrients in the normal individual, altered nutritional requirements and metabolism of nutrients in different disease states, and practical aspects of nutritional and metabolic support of different types of patients.

HUN 6301—Nutritional Aspects of Carbohydrates and Lipids (4) *Prereq: HUN 3246 or BCH 4024, PET 3350.* Role of carbohydrates and lipids in nutrition, with emphasis on energy metabolism.

HUN 6321—Proteins and Amino Acids in Nutrition (3) *Prereq: HUN 3246, 3221.* Digestion, absorption, and degradation; emphasis on turnover, requirements, assessment of quality, and effects of deficiencies, toxicities, and physiological stresses.

HUN 6331—Vitamins in Human Nutrition (3) *Prereq: BCH 4024 or HUN 3246.* Biochemical and physiological functions; nutrient requirements and interactions; response to deficiencies and excesses.

HUN 6356—Minerals in Nutrition (3) *Prereq: BCH 4024 or equivalent.* Biochemical and physiological aspects of mineral absorption, metabolism, and function.

HUN 6812C—Analytical Techniques in Nutritional Biochemistry (1) *Prereq: BCH 4024 or HUN 3246 and permission of instructor.* Biochemical analyses of tissues and fluids, radio-tracer methodology, metabolic studies, tissue handling, and formulation of experimental animal diets.

HUN 6905—Problems in Nutritional Sciences (1-2; max: 4) *Not open to students on probation or conditional admission.* Individual study carried out in laboratory, library, pilot plant, or food industry. H.
HUN 6910—Supervised Research (1-5; max: 5) S/U.
HUN 6936—Topics in Nutritional Sciences (1-3; max: 8) Special aspects or current developments in nutritional sciences.
HUN 6938—Nutritional Sciences Seminar (1; max: 2) Presentation of reports on research in nutrition.
HUN 6939—Advanced Clinical Nutrition (3) *Prereq: HUN 3246, DIE 4244, DIE 6942, or permission of instructor.* Application of normal and therapeutic nutrition principles to specific clinical topics based on cases from health center environment.
HUN 6940—Supevised Teaching (1-5; max: 5) S/U.
HUN 6971—Research for Master's Thesis (1-15) S/U.
HUN 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.
HUN 7980—Research for Doctoral Dissertation (1-15) S/U.

SCHOOL OF FOREST RESOURCES AND CONSERVATION
College of Agriculture

GRADUATE FACULTY 1993-94

Interim Director: L. G. Arvanitis. *Graduate Coordinator:* T. L. White. *Chair, Fisheries and Aquatic Sciences:* J. V. Shireman. *Acting Chair, Forestry:* H. L. Gholz. *Acting Chair, Wildlife and Range Sciences:* G. W. Tanner. *Katharine Ordway Professor of Ecosystem Conservation:* J. F. Eisenberg. *Carl Swisher Professor in Water Resources:* C. F. Schelske. *Professors:* L. G. Arvanitis; D. E. Canfield; K. C. Ewel; J. W. Fitzpatrick. D. M. Flinchum; D. J. Forrester; H. L. Gholz; L. R. Grosenbaugh; W. T. Haller; L. D. Harris; S. R. Humphrey; F. W. King; R. F. Labisky; A. C. Mace, Jr.; R. Q. Marston; T. Miller; C. P. Reid; D. L. Rockwood; R. A. Schmidt; J. V. Shireman; W. H. Smith; A. E. Squillace; E. L. Stone; T. T. Struhsaker. *Associate Professors:* G. M. Blakeslee; D. E. Campton; C. E. Cichra; N. B. Comerford; C. K. Dodd; M. L. Duryea; J. L. Foltz; J. D. Johnson; E. J. Jokela; W. M. Kitchens; W. J. Lindberg; H. F. Percival; K. M. Portier; F. Putz; H. Riekerk; W. Seaman, Jr.; G. W. Tanner; R. S. Webb; T. L. White. *Associate Scientist:* M. E. Sunquist. *Assistant Professors:* L. C. Branch; L. W. Lefebvre; T. J. O'Shea; E. J. Phlips; G. V. Powell; K. H. Redford; J. M. Schaefer. *Assistant Scientists:* A. B. Bolten; W. Cropper; S. K. Jacobson. *Assistant Extension Scientists:* C. N. Huegel; F. Mazzotti.

The School administers programs leading to the Master of Science, Master of Forest Resources and Conservation (nonthesis), and Doctor of Philosophy degrees in forest resources and conservation for the Departments of Forestry, Wildlife and Range Sciences, and Fisheries and Aquatic Sciences.

Programs in forest resources and conservation are offered in the following areas of specialization: Forestry—agroforestry, biometrics, biotechnology, ecology, economics, genetics, hydrology, management, nutrition, pathology, physiology, silviculture, soils, and wood products; Wildlife and Range Sciences—biology, wildlife diseases, ecology, and management; Fisheries and Aquatic Sciences-aquaculture, freshwater and marine ecology, limnology, genetics, microbiology, physiology, and management.

Graduate faculty include personnel with the U.S. Fish and Wildlife Service's Cooperative Fish and Wildlife Research Unit, the U.S. Forest Service, other federal and state agencies, and related departments on campus.

Graduate students should have appropriate undergraduate training in biological, social, and physical sciences, including physics, chemistry, and mathematics. Students with inadequate backgrounds may be required to take (without credit at the graduate level) undergraduate courses pertinent to their field of interest.

All graduate students are required to assist in teaching a course once (master's students) or twice (Ph.D. students who have not previously held a teaching assistantship) during the first two years of their programs.

The following courses in related areas will be acceptable for graduate credit as part of the candidate's major: AEB 6182—Intermediate Agricultural Production Economics; AEB 6453—Natural Resource Economics; AEB 6483—Regional Policy and Development; AEB 6553—Elements of Econometrics; AEB 6592—Activity Analysis for Economic Decisions; AEB 6625—Regional Economics; AGR 6233—Tropical Pasture and Forage Science; AGR 6311—Population Genetics; AGR 6323—Advanced Plant Breeding; AGR 6353—Cytogenetics; ANS 5446—Animal Nutrition; ANS 6368—Quantitative Genetics; ANS 6715—Ruminant Nutrition and Digestive Physiology; BCH 6415—Advanced Molecular and Cell Biology; BOT 5405C—Algology; BOT 5505C— Intermediate Plant Physiology; BOT 5625—Plant Geography; BOT 5695—Ecosystems of Florida; BOT 6526—Plant Nutrition; BOT 6566— Plant Growth and Development; EES 5007—Ecological and General Systems; EES 5308—Wetlands Ecology; EES 6136—Aquatic Autotrophs; EES 6166—Aquatic Heterotrophs; ENY 6502—Aquatic Insects; GEO 5145C—Remote Sensing; GLY 5704—Geomorphology; GLY 5820—Groundwater Geology; GMS 6152—Molecular Genetics; MAN 6511—Production Management Problems; PCB 5046—Advanced Ecology; PCB 5065—Principles of Genetics; PCB 5307C—Limnology; PCB 5317C—Marine Ecology; PCB 5415C—Behavioral Ecology; PCB 6356C—Ecosystems of the Tropics; PCB 6377C— Physiological Ecology of Vertebrates; PCB 6447C— Community Ecology; PCB 6496C—Stream Ecology; PCB 6686C—Experimental Population Ecology; SOS 5132—Tropical Soils; SOS 6233— Forest Soils; ZOO 5265—Crustacean Biology; ZOO 5405C—Physiology of Marine Animals; ZOO 5458—Fish Physiology; ZOO 5486C—Mammalogy; ZOO 6416C—Biology of Amphibia; ZOO 6456C—Ichthyology; ZOO 6466C—Biology of Reptilia; ZOO 6506C—Ethology; ZOO 6816—Zoogeography; ZOO 6939—Seminar in Animal Behavior.

FAS 5225—Fish Genetics (3) *Prereq: AGR 3303, PCB 3063, or equivalent; BCH 4024 and STA 3023.* Genetic characteristics from population and organismic perspective. Focus on population and evolutionary genetics, quantitative genetics, cytogenetics, and molecular genetics of economically important species. Offered in spring of odd numbered years.
FAS 5275C—Fish Ecology and Management (4) *Prereq: FAS 4305C or consent of instructor.* Principles of fish ecology includ-

ing environmental factors; habitat requirements, trophic dynamics, and management techniques to enhance fish production. Offered fall semester of odd-numbered years.

FAS 5405C—Principles of Aquaculture (4) *Prereq: course in fishery science or limnology, or consent of the instructor.* History and development of regional and global aquaculture, species selection and biology, management practices and issues, economics and marketing. Offered summer term of even-numbered years.

FAS 6265—Management of Reproduction in Aquatic Animals (3) *Prereq: courses in ecology and animal physiology.* Ecological, behavioral, and physiological control mechanism/ models of reproduction, and how they may be manipulated in fisheries and aquaculture. Offered spring semester of odd-numbered years.

FAS 6335C—Quantitative Fisheries Biology (4) *Prereq: FAS 5275C or equivalent.* Population sampling and estimation, stock-recruitment relationships, and prediction of sustainable yields in fisheries. Offered spring semester of even-numbered years.

FAS 6933—Seminar (1; max: 2) S/U. Offered spring semester of even-numbered years.

FNR 5335—Agroforestry (3) Biological, ecological, socioeconomic, and technical-managerial aspects of tree/crop, tree/animal, and tree/crop/animal systems. Examples of traditional and modern, rotational, and intercropped systems, and analyses of their structure, functioning, and potentials, with special reference to the tropics and subtropics. Offered spring semester.

FNR 5563—Simulation of Ecological Models (3) *Prereq or coreq: COP 3210.* Design of ecological models; simulation on small and large digital computers.

FNR 6608—Research Planning (2) *Prereq: consent of instructor.* For beginning graduate students; history and philosophy of science, scientific method, development of a research proposal. Research facilities and programs are presented. Offered fall semester.

FNR 6905—Research Problems in Forest Resources and Conservation (1-6; max: 10) H.

FNR 6910—Supervised Research (1-5; max: 5) S/U.

FNR 6934—Topics in Forest Resources and Conservation (1-4; max: 10) Selected topics in forestry, wood science, range, recreation, wildlife, and fisheries.

FNR 6940—Supervised Teaching (1-5; max: 5) S/U.

FNR 6971—Research for Master's Thesis (1-15) S/U.

FNR 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.

FNR 7980—Research for Doctoral Dissertation (1-15) S/U.

FOR 5625—Forest Water Resources Management (3) *Prereq: FOR 4162, SOS 3022C.* Forest management practices in relation to hydrologic responses and water quality considerations. Offered spring semester of even-numbered years.

FOR 6154—Analysis of Forest Ecosystems (3) *Prereq: graduate status or consent of instructor.* Energy, water, carbon and nutrient fluxes in forests; applications to forest and landscape management. Offered spring semester of odd-numbered years.

FOR 6167—Advanced Silviculture (3) *Prereq: FOR 4162 or consent of instructor.* Influence of silvicultural practices on tree and stand growth and forms of these practices; environmental impact. Offered spring semester of even-numbered years.

FOR 6170—Tropical Forestry (3) *Prereq: FOR 4162.* Climatic influences, forest types, wood properties, and forest management practices. Offered spring semester of even-numbered years.

FOR 6310—Forest Genetics (3) *Prereq: acceptable background in genetics.* Application of principles of genetics in the silvicultural handling of forest stands; selection, hybridization, and tree-breeding techniques. Offered fall semester of even-numbered years.

FOR 6337C—Advanced Forest Pathology (4) *Prereq: PLP 3002, 3003L, or FOR 3333; FOR 4162.* Principles of forest epidemiology; biology; ecology and management of important diseases. Offered spring semester of odd-numbered years.

FOR 6340—Physiology of Forest Trees (3) *Prereq: BOT 3503C and BCH 3023 or equivalent.* Factors influencing forest tree and stand energy balance, flowering, seed production, germination, water relations, and growth; applications to forestry problems. Offered spring semester of even-numbered years.

FOR 6453—Advanced Forest Mensuration (3) *Prereq: consent of instructor.* Growth modeling, sampling designs, simulation of stand dynamics, linear and nonlinear estimation of biomass and other parameters. Offered fall semester of even-numbered years.

FOR 6543—Economic Analysis of Forest Operations (3) *Prereq: FOR 4541 or equivalent.* Emphasis on plantation forestry. Offered fall semester of even-numbered years.

FOR 6627—Quantitative Methods in Forest Management (3) *Prereq: COP 3210, or permission of instructor.* Application of operations research and digital computer simulation models for harvest scheduling and forest management decisions. Offered spring semester of even-numbered years.

FOR 6933—Seminar (1; max: 2) S/U.

WIS 5323C—Impact of Diseases on Wildlife Populations (3) *Prereq: WIS 3401 or equivalent.* Emphasis on avian and mammalian populations of North America. Offered spring semester of odd-numbered years.

WIS 5555C—Conservation Biology (3) *Prereq: basic courses in ecology, genetics.* Application of biological and resource management theory to the problem of the conservation of natural communities. Offered fall semester of even-numbered years.

WIS 6452—Wildlife Ecology (3) *Prereq: WIS 3401 or equivalent.* Emphasis on population processes of wildlife resources in subtropical and temperate ecosystems, and on policy processes governing management of ecosystems. Offered fall semester of odd-numbered years.

WIS 6453—Wildlife Community Ecology (3) *Prereq: WIS 3401C or equivalent.* Measurement and statistical analysis of community structure; experimental testing of community interaction; emphasis on application of theory to management. Offered fall semester of even-numbered years.

WIS 6457C—Wildlife Behavior (4) *Prereq: consent of instructor.* Social organization, territoriality, mating systems, migration, population cycles, and predator-prey relationships in wildlife populations.

WIS 6464—Wildlife Habitat Analysis (3) Measurement of compositional and structural aspects of plant communities in relation to animal needs. Application of wildlife habitat models.

WIS 6933—Seminar (1) S/U.

WIS 6934—Topics in Wildlife Ecology (1-2; max: 6) *Prereq: WIS 6452, 5555C, or permission of instructor.* Advanced concepts and practices in wildlife management and conservation. Topics vary.

ZOO 5265C—Crustacean Biology (4) *Prereq: ZOO 3203C or permission of instructor.* Biology of crustacea including systematics, physiology, and adaptations to environment, behavior, life history strategies, and community ecology. Offered spring semester of even-numbered years.

FOUNDATIONS OF EDUCATION
College of Education

GRADUATE FACULTY 1993-94

Chairman: J. J. Algina. *Graduate Coordinator:* B. J. Guinagh. *Professors:* J. J. Algina; P. T. Ashton; B. B. Brown *(Emeritus)*; L. M. Crocker; S. B. Damico; G. E. Greenwood; W. H. Guertin *(Emeritus)*; M. L. Koran; J. M. Newell; A. J. Newman; R. R. Renner; R. R. Sherman; H. L. Wass *(Emeritus)*; R. B. Webb; A. O. White. *Associate Professors:* S. D. Andrews; J. K. Bengston; W. A. Busby; C. L. Frisby; B. J. Guinagh; M. D. Miller. *Assistant Professor:* J. H. Kranzler.

The Department offers the Master of Education, the Master of Arts in Education (with thesis), the Specialist in Education, the Doctor of Education, and the Doctor of Philosophy degrees with programs in educational psychology, foundations of education, research and evaluation methodology, and school psychology.

Specific areas of specialization include human development, personality theory, learning theory, and general educational psychology within psychological foundations; research methodology, education statistics, and measurement and evaluation within research foundations; social, historical, and philosophical foundations; and comparative and international education within social foundations.

EDF 5431—Measurement and Evaluation in Early Childhood (3) Basic concepts of test construction and interpretation, including norms, reliability, and validity. Overview of assessment techniques and problems in assessing intelligence, language, achievement, socio-emotional, and perceptual motor development in children from infancy through six years of age. Students may not receive credit for both EDF 4430 and EDF 5431.

EDF 6113—Educational Psychology: Human Development (3) Current research and theories in the area of human development.

EDF 6175—Educational Psychology: Adulthood (3) Current theories and research findings in adulthood, including cognitive processes, learning abilities, vocational development, leisure, and various aspects of adult education through the life cycle.

EDF 6185—Educational Psychology: Aging (3) Psychological and social processes in aging; lifelong learning; education for and about aging.

EDF 6188—Issues in Childhood and Death (3) Theoretical perspectives and research concerning death related thoughts, feelings, and experiences.

EDF 6189—Psycho-Social-Educational Aspects of Death and Dying (3) Attitudes toward death, dying process, funeral practices, and grieving. Role of education for better understanding and coping with death.

EDF 6211—Educational Psychology: General (3) Basic principles, techniques, and research; designed for graduate students preparing to teach who have a minimal background in psychology.

EDF 6215—Educational Psychology: Learning Theory (3) *Prereq: consent of instructor.* Logic and methodologies of theories of learning.

EDF 6232—Principles of Learning and Instructional Practice (3) Topics include transfer of training, reinforcement, forgetting, and problem solving.

EDF 6338—Self-Concept Theory and Its Application to Education (3) An in-depth examination, including basic principles, research, and applications in educational settings.

EDF 6355—Educational Psychology: Personality Dynamics (3) Dynamics of behavior and their implications for education, counseling and guidance, administration, family relationships, and social action.

EDF 6401—Educational Statistics (3) *Prereq: STA 3023. Primarily for Ed.D. candidates.* Application to educational data and problems.

EDF 6403—Quantitative Foundations of Educational Research (6) *Prereq: STA 3013, 3023, or equivalent.* Integrated coverage of fundamentals in the general field of education research. Includes statistics, experimental design, and data processing.

EDF 6436—Theory of Measurement (4) *Prereq: STA 3023; EDF 4430.* Introductory study of true score models, reliability, validity, norms, scaling, item analysis, and basic elements of instrument construction.

EDF 6475—Qualitative Foundations of Educational Research (4) Introduction to philosophical, historical, sociological, and other methodologies as aspects of qualitative educational research.

EDF 6481—Quantitative Research Methods in Education (4) *Prereq: STA 3013, 3023 or equivalent.* Design and data analysis for educational research.

EDF 6487—Assessment of Classroom Behavior (3) Instruction in at least four systems for measuring teacher-pupil behavior, representing the social-emotional and cognitive domains. Observation practiced in classrooms as well as with audio and videotape and film.

EDF 6520—History of Education (3) Salient issues in education from the Reformation to the present.

EDF 6525—Ancient and Medieval Education (3) Pedagogical practice and thought in China, India, Semitic nations, Greece, Rome, Islam, and Medieval and Renaissance Europe.

EDF 6544—Philosophical Foundations of Education (3) Philosophical bases for democracy and education.

EDF 6606—Socioeconomic Foundations of Education (3) Sociological analysis of democratic educational aims, the school as a social system, interest groups, the teaching profession, and economic stratification in America.

EDF 6608—School and Society (3) Sociocultural framework for understanding the relationship between a society and its educational system.

EDF 6630—Educational Sociology (3) Sociological theory and research with direct relevance to the study of education.

EDF 6812—Comparative Education (3) Relationships of school and society in different cultural areas of the world.

EDF 6820—Education in Latin America (3) Traditions and contemporary social, political, and cultural aspects.

EDF 6905—Individual Study (1-3; max: 12) *Prereq: consent of department chairman.* For advanced students who wish to study individual problems in psychological, social, or philosophical foundations of education, or research and measurement under faculty guidance.

EDF 6910—Supervised Research (1-5; max: 5) *Prereq: consent of department chairman.* S/U.

EDF 6933—Seminar on Research on Effective Teaching (3) *Prereq: EDF 6403.* Analysis of quantitative and qualitative research on teaching; emphasis on implications for educational policy and practice.

EDF 6938—Special Topics (1-3; max: 12) *Prereq: consent of department chairman.*

EDF 6940—Supervised Teaching (1-5; max: 5) *Prereq: consent of department chairman.* S/U.

EDF 6941—Practicum in Educational Research (2-9; max: 9) *Prereq: EDF 6403. Arrangements must be made with instructor prior to registration.* Experience in conducting various phases of quantitative or qualitative educational research under individual supervision.

EDF 6943—Practicum in Educational Psychology (3; max: 9) *Prereq: consent of instructor.* Supervised experience in a practical work situation dealing with problems and issues appropriate to psychological foundations and their resolution.

EDF 6971—Research for Master's Thesis (1-15) S/U.

EDF 7117—Affective Development and Education (3) *Prereq: EDF 6113 or equivalent.* Application of theory and research.

EDF 7146—Educational Psychology: Cognition in the Educative Process (3) *Prereq: EDF 6113.* Cognitive development as applied to curriculum development and teaching procedures.

EDF 7186—Educational Psychology: Advanced Seminar in Aging (3) *Prereq: EDF 6185 or consent of instructor.* Research literature on aging process; implications for education planning; critical examination of existing programs.

EDF 7229—Advanced Educational Psychology: Learning (3; max: 9) *Prereq: EDF 6215.* Educational implications of contemporary approaches to learning. Relationship between topics in learning and their implications for instructional practices.

EDF 7405—Advanced Quantitative Foundations of Educational Research (4; max: 8) *Prereq: EDF 6403.* Integrated coverage of important approaches to educational research. Includes application of experimental design, regression analysis, and computer processing to selected educational research problems.

EDF 7432—Advanced Psychometric Theory (3; max: 6) *Prereq: EDF 6436 or equivalent.* Study of theoretical problems related to test construction. Current developments in reliability and validity estimation; alternate true-score models; item analysis and scoring techniques, scaling, assessing latent traits, and methods for psychometric research.

EDF 7439—Item Response Theory (3) *Prereq: EDF 6436.* Psychometric models for test scores; estimation of ability and item parameters; applications of and current issues in IRT.

EDF 7486—Methods of Educational Research (3) *Prereq: STA 3023. Primarily for Ed.D. candidates.* Examination of research methodologies. Problem identification as well as organization and presentation of data.

EDF 7491—Evaluation of Educational Products and Systems (3) *Prereq: EDF 6403 or equivalent.* Models and methods for formative and summative evaluation of educational products and programs.

EDF 7555—Values and Ethics in Education (3) The conception and role of values in education, with special emphasis on moral values (ethics).

EDF 7573—Contemporary Education Theories (3) Seminar for post-master's students. Contemporary philosophical theories of education.

EDF 7584—Educational Classics (3; max: 6) Historical and philosophical examination of enduring writings on education from ancient to modern times.

EDF 7639—Research in Educational Sociology (3) Research techniques in educational sociology, emphasis on ethnography.

EDF 7931—Seminar in Educational Research (3; max: 6) *Prereq: EDF 6403.* In-depth examination of specific methodological approaches to educational research.
EDF 7932—Multivariate Analysis in Educational Research (3) *Prereq: EDF 6403.* Review of selected studies with focus on methods of data analysis. Emphasis on use of multivariate techniques.
EDF 7934—Seminar in Educational Foundations (3; max: 12) Advanced study in historical, philosophical, social, psychological, aesthetic, and comparative foundations; and educational research and methodology.
EDF 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.
EDF 7980—Research for Doctoral Dissertation (1-15) S/U.
SPS 6052—Issues and Problems in School Psychology (3) *Coreq: SPS 6941.* History and foundations of school psychology; legal, ethical. Overview of role and functions of school psychologist.
SPS 6191—Psychoeducational Assessment I (3) *Coreq: SPS 6941.* Techniques for assessing intelligence, adaptive behavior, and achievement of children and school-aged adolescents. Emphasis on standardized instruments.
SPS 6192—Psychoeducational Assessment II (3) *Prereq: SPS 6191; coreq: SPS 6941.* Techniques for assessing social and emotional functioning of the school-aged child; supervised experience in assessment and report writing.
SPS 6197—Psychoeducational Assessment III (3) *Prereq: SPS 6191; coreq: SPS 6941.* Synthesis of sources and techniques of psychoeducational assessment for school-related application and problems.
SPS 6941—Practicum in School Psychology (1-4; max: 8) *Prereq: consent of instructor.* S/U.
SPS 7205—School Psychology Consultation (3) *Coreq: SPS 6941.* Concepts, processes, and issues related to the practice of school-based consultation as an intervention technique of school psychologists.
SPS 7809—Advanced Topics in School Psychology (3; max: 6) *Prereq: consent of instructor.* In-depth analysis of selected developments in school psychology.
SPS 7931—Seminar in School Psychology (1-3; max: 3) *Prereq: consent of instructor.* Issues pertinent to the professional practice of school psychology.
SPS 7949—Internship in School Psychology (6; max: 18) *Prereq: consent of instructor.*

GEOGRAPHY
College of Liberal Arts and Sciences

GRADUATE FACULTY 1993-94

Chairman: E. J. Malecki. *Graduate Coordinator:* T. J. Fik. *Professors:* G. A. Antonini; H. J. Armstrong; C. N. Caviedes; J. R. Dunkle; S. M. Golant; E. J. Malecki; H. L. Popenoe; N. J. H. Smith; G. I. Thrall. *Associate Professors:* T. J. Fik; J. A. Henry; A. J. Lamme III; P. R. Waylen. *Assistant Professors:* A. C. Goldman; J. Mossa.

The Department of Geography offers the Master of Arts, Master of Science, and Doctor of Philosophy degrees. It also offers a Master of Arts in Teaching and a Master of Science in Teaching, which are nonthesis degrees. The Department offers three primary areas of specialization for graduate research: economic development and policy, physical geography, and tropical agriculture. Economic development and policy studies concern topics such as coastal management, the elderly, entrepreneurship, historic places, spatial economic theory, technological change, and urban land use. Tropical agriculture may be pursued in Africa or Latin America. Physical geography work may be pursued in climatology, coastal management, fluvial geomorphology, and hydrology. Prospective applicants should examine the research interests of the Department's faculty to obtain a more detailed appreciation of the Department's specialties.

To ensure the incorporation of relevant interdisciplinary perspectives in each student's program, the Department maintains close ties with other departments in Liberal Arts and Sciences, and with programs in Latin American and African studies, urban and regional studies, tropical agriculture, tropical ecology, gerontological studies, water resources, the College of Education, and the College of Business Administration. Certificates in certain of these fields may be obtained in addition to graduate degrees in geography.

A graduate student should preferably have an undergraduate major in geography, but applicants with degrees in one of the social or physical sciences are accepted into the Department's graduate program. Deficiencies in undergraduate work in geography can be corrected concurrently with registration in graduate level courses. All students in the graduate program are required to take courses in contemporary geographic thought and geographic research skills.

GEA 6109—Tropical Lands and Their Utilization (1-10; max: 10) *Prereq: GEO 4124.* Field course emphasizing analytic inquiries into land use systems in the tropics. Special topics on land utilization types, environmental influences, settlement, field patterns, market factors, labor supply, transportation.
GEA 6309—Seminar: Middle America and the Caribbean (3) Cultural, economic, political, and resource characteristics and development of representative areas.
GEA 6419—Seminar: South America (3) Cultural, economic, political, and resource characteristics and development of representative areas.
GEA 6468L—Resource Utilization and Conservation in Latin America (3) Regional appraisal of human and natural resources. Analysis of the role of resource utilization and conservation in the development of Latin American countries.
GEO 5105C—Advanced Cartography (3) *Prereq: GEO 4100; COP 3110, 4215 or consent of instructor.* Advanced methods including computer cartography and elements of cartographic reproduction.
GEO 5125C—Advanced Air Photo Interpretation (3) *Prereq: GEO 2200 or consent of instructor.* Uses of aerial photographs in geographical research.
GEO 5145C—Remote Sensing (3) *Prereq: GEO 4124.* Uses of remote sensing imagery in geographical research.
GEO 5166C—Advanced Quantitative Analysis in Geography (3) *Prereq: GEO 4164; STA 6166 or equivalent.* Use of advanced quantitative techniques with geographic applications; development of research methods integrating quantitative analysis.
GEO 5346—Natural Hazards (3) Multidisciplinary analysis of natural and man-induced environmental catastrophes— their perception and institutional adjustments.
GEO 5437C—Research Methods in Population Geography (3) Most frequently used research methods.
GEO 5556—Geography of Innovation and Technological Change (3) Generation, development, and spread of innovations by individuals, corporations, and organizations. Emphasis on impact of innovations and technology on regional development and change.
GEO 5567—Industrial Location (3) *Prereq: GEO 3502 or consent of instructor.* Emphasis on location theory and its practical applications.
GEO 5605—Advanced Urban Geography (3) Theoretical and planning literature that examines the locational and environmental issues confronting contemporary North American urban populations.
GEO 5615—Housing and Environments of the Elderly (3) Examination of the housing status and needs (social, psychological, economic, planning) of the U.S. elderly population. Discussion of both policy and theoretical issues.
GEO 5704—Transportation Geography (3) *Prereq: GEO 2500, 3502, or consent of instructor.* Introduction to and assessment of current methods of describing, analyzing, and explaining spatial patterns of transport phenomena.
GEO 5809—Geography of World Agriculture (3) World distribution of crops and livestock in relation to natural and cultural conditions; discussion of problems of agriculture in terms of

products, economic organization, and agricultural regions; significance of world affairs.
GEO 5839—Land Tenure and Rural Settlement (3) Advanced study of systems of land tenure throughout the world, with special attention to geographical factors underlying their development.
GEO 5905—Individual Study: Directed Reading (3; max: 12 including GEO 6905)
GEO 5920—Geography Colloquium (1; max: 6) Presentation and discussion of contemporary geographic research. S/U.
GEO 5930—Selected Topics in Geography (1-5; max: 15) *Prereq: graduate standing.*
GEO 5945C—Field Course in Geography (3) Methods of geographical fieldwork. Observation, classification, interpretation, note-taking, traversing, and mapping of data. Aerial analysis; landforms, climate, vegetation, soils, resources, settlement patterns, and land use.
GEO 6118C—Contemporary Geographic Thought and Research (3) *Prereq: admission to graduate program in geography.* A summary of major currents of intellectual thought and research orientations in contemporary geography.
GEO 6356—Seminar: Land and Water Utilization (3) *Prereq: consent of instructor.* Selected problems in utilization of land and water resources.
GEO 6429—Seminar: Cultural Geography (3) A review of literature, theoretical frameworks, and research design formulation in contemporary cultural geography.
GEO 6435—Seminar in Population (3) Combination lecture and seminar dealing with social and population problems from a spatial perspective. Major research project required.
GEO 6509—Seminar: Economic Geography (3) *Prereq: consent of instructor.* Selected problems in geography of economic activity.
GEO 6626—Advanced Spatial Theory and Public Policy Analysis (3) *Prereq: one year of calculus or consent of instructor.* A theoretical analysis of urban spatial structure, urban spatial problems, and optimal spatial policy. Topics include spatial conflict, unequal treatment of equals in space, and theoretical evaluation.
GEO 6905—Individual Work (1-5; max: 12 including GEO 5905)
GEO 6910—Supervised Research (1-5; max: 5) S/U.
GEO 6938—Selected Topics in Geography (1-5; max: 15) *Prereq: graduate standing in geography or a related field.*
GEO 6940—Supervised Teaching (1-5; max: 5) S/U.
GEO 6943—Internship in College Teaching (2,4,6; max: 6) Required for Master of Arts in Teaching and Master of Science in Teaching candidates but available for students needing additional practice and direction in college-level teaching.
GEO 6946—Individual Fieldwork (3; max: 15)
GEO 6971—Research for Master's Thesis (1-15) S/U.
GEO 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.
GEO 7980—Research for Doctoral Dissertation (1-15) S/U.

GEOLOGY
College of Liberal Arts and Sciences

GRADUATE FACULTY 1993-94

Chairman: A. F. Randazzo. *Graduate Coordinator:* P. A. Mueller. *Graduate Research Professor:* D. L. Dilcher. *Professors:* F. N. Blanchard; J. E. T. Channel; D. S. Jones; B. J. MacFadden; G. H. McClellan; P. A. Mueller; N. D. Opdyke; M. R. Perfit; E. C. Pirkle, Jr., *(Emeritus)*; A. F. Randazzo; D. L. Smith; S. D. Webb. *Associate Professors:* P. F. Ciesielski; J. L. Eades; D. A. Hodell; D. P. Spangler. *Assistant Professors:* K. E. Johnson; R. C. Lindquist. Associate In: G. D. Shaak.

The Department of Geology offers programs leading to the Master of Science (thesis), the Master of Science in Teaching (nonthesis), and the Doctor of Philosophy degrees. Areas of specialization include economic geology, engineering geology, environmental geology, geochemistry, geomorphology, geophysics, hydrogeology, industrial mineralogy, isotope geology, marine geology, mineralogy, paleomagnetism, paleontology, petrology, sedimentary petrology, sedimentology, and stratigraphy.

For admission to graduate status in the Department of Geology, a student must have a baccalaureate degree with a major in geology or a related field. A summer field course is required. Deficiencies in undergraduate work in geology can be corrected by completing the undergraduate courses without credit while enrolled as a graduate student.

Applicants for any of the programs in geology must have completed courses in the areas of physical geology, historical geology, crystallography-mineralogy, igneous and metamorphic petrology, optical mineralogy, sedimentary geology, invertebrate paleontology, and structural geology. In addition, students must have completed courses in supportive sciences, such as mathematics, physics, chemistry, statistics, and biology.

A minimum of 30 semester hours of graduate level courses will be required for the Master of Science in geology. At least 24 hours must be in organized graduate level geology courses (excluding research, teaching, special projects, etc.). Six hours of thesis research credit are required. All master's degrees are terminal and do not entitle the recipient to automatic admission to the doctoral program. A separate and new application for admission to the doctoral program is required.

Of the 90 semester hours required for the Ph.D., 45 must be in formal, organized graduate-level classwork (excluding individual work, supervised research and teaching, advanced research, dissertation, special projects, etc.). Remaining credits will be in GLY 7979, 7980, additional geology courses, or a declared minor in another field.

For the Master of Science in Teaching degree, at least 36 hours are required. Six of these hours must be in GLY 6943 and at least 24 must be in organized graduate-level geology courses. The remaining six hours must be in approved electives. Passage of a final oral examination is required of all candidates.

Each applicant (M.S. and Ph.D.) must take both the General and Advanced (Geology) Tests of the Graduate Record Examination. Applicants for the Ph.D. or M.S. degree program who are from a discipline outside geology must take the Advanced GRE in their particular field. The scores of these examinations must be reported to the Department of Geology. Three letters of recommendation are also required for admission to the doctoral program and for financial aid applications.

The Department of Geology has prepared a document of policies, procedures, and requirements pertaining to its graduate programs and a brochure describing current faculty and their research interests. Copies may be obtained by contacting the Department directly.

BOT 5115—Paleobotany (3) *Prereq: upper-level course in botany or geology or permission of instructor.* Comparative study of plants through geologic time with attention to morphology and evolution of major groups of land plants based on the fossil records.
GLY 5156—Geologic Evolution of North America (3) Integrated overview in terms of modern tectonic theory.
GLY 5221—Optical Crystallography (3) Theory of crystal optics and the application of the polarizing microscope to optical properties of nonopaque substances.
GLY 5230—Mineralogical Analysis by X-Ray Methods (3) Theory and practice of X-ray diffraction and emission, with emphasis on identification of crystalline materials.
GLY 5241C—Geochemistry (3) The abundance and distribution of the elements and their behavior during various geological processes.
GLY 5328—Advanced Igneous Petrology (3) *Prereq: GLY 4310C, 5241C.* Compositional variability, phase relations, and petrogenetic history of igneous rocks and the mantle.
GLY 5450—Introduction to Geophysics and Tectonics (3) *Prereq: GLY 2010C or 2991C and one year of college physics or*

permission of instructor. Physics of the Earth. Study of gravity and magnetic fields, seismic waves, thermal history, orogenic belts and plate tectonic theory.

GLY 5476—Principles of Exploration Geophysics (3) *Prereq: GLY 2010C or 2991C and one year of college physics or permission of instructor.* Reflection and refraction seismology, gravitational, magnetic and electrical methods of exploration; instrumentation, surveying techniques, data reduction and interpretation.

GLY 5558C—Sedimentology (3) Analytical methods and geological interpretation of clastic sediments.

GLY 5640—Vertebrate Paleontology (3) *Prereq: ZOO 3703C or GLY 2100C.* Evolutionary history of major vertebrate groups, with emphasis on principles of prehistoric investigation.

GLY 5704—Geomorphology (3) *Prereq: GLY 4400C.* Application of the principles of geomorphology to the origin and evolution of landscapes.

GLY 5737—Marine Geology (3) A detailed introduction to the origin and evolution of ocean basins, ocean margins, and oceanic sediments and microfossils, including a paleoceanographic history of the marine realm.

GLY 5827—Ground Water Geology (3) Principles of ground water geology, with special reference to the Coastal Plain and Florida.

GLY 6247—Igneous and Metamorphic Geochemistry (3) The origin of igneous and metamorphic rocks and their environments as determined by their chemical and mineralogic composition.

GLY 6249—Chemical Sedimentology (3) Chemical (inorganic and biochemical precipitates and organic matter) sediments and sedimentary rocks with emphasis on comparison of modern and ancient depositional environments, facies relationships and diagenesis.

GLY 6250—Mineralogy of Clays (3) *Prereq: GLY 5230.* Structure, composition, properties, origin, and mode of occurrence of clay minerals.

GLY 6268—Isotope Geology (3) *Prereq: GLY 5241C.* Application of radiogenic and stable isotopes to the solution of geologic problems such as geochronology, petrogenesis and paleoclimatology.

GLY 6297—Topics in Geochemistry (3; max: 12) Problems in igneous and metamorphic petrogenesis, geochronology, radiogenic isotopes, stable isotopes, and marine geochemistry.

GLY 6346—Sedimentary Petrology and Petrography (3) Origin, composition, and structures of sedimentary rocks, including tectonic, paleogeographic, and environmental interpretation.

GLY 6351—Carbonate Sedimentology (3) Limestones and dolostones, their origin, occurrence, and significance; study of recent and ancient carbonate depositional regimes.

GLY 6424—Tectonics (3) Evolution and formation of mid-ocean ridges, seamounts, hot spots, island arcs, back-arc basins, passive margins and mountain chains.

GLY 6468—Paleomagnetism (3) Geomagnetism, principles of rock magnetism, applications of paleomagnetism, magnetic stratigraphy.

GLY 6620—Micropaleontology (3) Classification and identification of biostratigraphically important microfossil groups and their use in local and regional correlation.

GLY 6660C—Paleoecology (3) *Prereq: ZOO 3203C.* Paleoautecology, paleosynecology, historical biogeography of marine invertebrates, and ecological rules as applied to fossil invertebrates.

GLY 6698—Topics in Paleobiology (2; max: 4) Phylogeny, ontogeny, evolution, extinction, paleoecology, morphometrics, and taphonomy.

GLY 6813—Nonmetalic Geologic Materials (3) *Prereq: GLY 4800.* The geologic occurrences, properties, and uses of limestone, shales and other nonmetalic deposits.

GLY 6825—Hydrogeology (3) *Prereq: GLY 5827.* Principles and concepts of ground water flow systems; techniques of flow system delineation; hydrogeologic problems common to water development.

GLY 6826—Hydrogeologic Modeling (3) Applications of computer modeling to hydrogeologic problems through use of analytical and numerical solutions.

GLY 6905—Individual Work (1-4; max: 12) For work beyond that offered in regular courses.

GLY 6910—Supervised Research (1-5; max: 5) S/U.

GLY 6931—Seminar (1; max: 2) Reading in special topics.

GLY 6932—Special Topics in Geology (1-3; max: 9) Lectures, conferences, or laboratory sessions covering selected topics of current interest in modern geology.

GLY 6940—Supervised Teaching (1-5; max: 5) S/U.

GLY 6943—Internship in College Teaching (2,4,6; max: 6) Required for Master of Science in Teaching candidates but available for students needing additional practice and direction in college-level teaching.

GLY 6949—Cooperative Work Experience (1; max: 7) Practical cooperative work experience under approved industrial supervision. S/U.

GLY 6971—Research for Master's Thesis (1-15) S/U.

GLY 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.

GLY 7980—Research for Doctoral Dissertation (1-15) S/U.

GERMANIC AND SLAVIC LANGUAGES AND LITERATURES
College of Liberal Arts and Sciences

GRADUATE FACULTY 1993-94

Chair: K. Bullivant. *Graduate Coordinator:* F. O. Futterknecht. *Professors:* E. C. Barksdale; K. Bullivant; F. O. Futterknecht; A. Stephan. *Associate Professors:* O. W. Johnston; H. W. Kraft; D. M. Popp; H. H. Rennert; H. Stephan; W. J. Sullivan III. *Assistant Professor: S. M. DiFino.*

The Department offers an M.A. (with or without thesis) and a Ph.D. in German. Prerequisite for admission to graduate work is an undergraduate major in the field, including advanced courses in both literature and language. Qualified candidates with B.A. degrees in related disciplines will be considered. Those students who wish to enter the Ph.D. program must have an M.A. in German. A good foundation in a second language is desirable for M.A. candidates. Ph.D. candidates should consult the Graduate Coordinator for details on the foreign language requirement. Graduate students normally teach as a part of their training.

German Language

GER 6060—Beginning German for Graduate Students I (3) For graduate students from other departments who need to acquire a reading knowledge of German. Not open to graduate students in German. S/U.

GER 6061—Beginning German for Graduate Students II (3) *Prereq: GER 6060 or its equivalent.* For graduate students from other departments who need to acquire a reading knowledge of German. Not open to graduate students in German. S/U option.

GER 6505—German Culture (3) Interdisciplinary study of periods and major aspects of German culture from the Middle Ages to the present.

GER 6845—History of the German Language (3) Major periods and trends from the beginning to the present.

GER 6858—The Structure of German (3) Analysis of the structure of modern High German. Special attention to structural similarities and differences of German and English.

GER 6940—Supervised Teaching (1-3; max: 3) *Prereq: departmental approval.* S/U.

German Literature (Writings)

GET 6195—German Film and Literature (3) Study of modern German films in the context of modern German culture and literature.

GEW 6205—Foundations of Literary Study (3) *Required for M.A. and Ph.D. candidates in German.* Focus on literary criticism and methodology. Different theoretical approaches to literature and research techniques. Recent developments.

GEW 6266—The History of the German Novel (3) Rise of the novel, its changing form and function from eighteenth century to present. The novel of development and the novel of the artist.

GEW 6305—Studies in German Drama and Theater (3) Main trends in the development of German drama during different literary periods. Analysis of individual plays and theoretical texts.
GEW 6339—History of German Poetry (3) Major aspects of German poetry from the beginnings to the present. Representative texts.
GEW 6405—Medieval and Renaissance Literature (3) Courtly and heroic epic, Volksbücher, and major genres and trends from the Medieval and Renaissance period.
GEW 6425—Seventeenth and Eighteenth Century Literature (3) Analysis of major trends, authors, and texts from the Baroque period to Sturm und Drang.
GEW 6535—German Classical Literature (3) Major trends and texts. Special attention to Goethe and Schiller. Emphasis on connections between socio-political context and developments in culture and aesthetics.
GEW 6545—Studies in Romantic and Post-Romantic Literature (3) Romantic movement and "Young Germany." Social goals, forms, and stylistic features of literature from this period.
GEW 6558—Realism and Naturalism (3) Writers of the nineteenth century, including Keller, Raabe, Meyer, Storm, Fontane, Hauptmann. Theories of the novelle, drama, and lyric poetry.
GEW 6735—Modern German Literature (3) Literary trends and major works of early twentieth century. Authors may include Mann, Rilke, Kafka, and Hesse. Relation to contemporary cultural and aesthetic developments.
GEW 6736—Contemporary German Literature (3) Literary trends from 1945 to present. Relation to contemporary cultural and aesthetic developments. Current developments.
GEW 6755—Contribution of Women in German Literature (3) Image of women in German literature and unique contributions of German-speaking women writers to literary history. Interdisciplinary study of modern literary methodology and aesthetic approaches to women's literature.
GEW 6826—German Literary Theory (3) Major figures in the field from nineteenth century to present. Emphasis on the question of hermeneutics and the different responses developed by literary theoreticians in Germany. Special focus on most recent developments in the field.
GEW 6900—Seminar in Germanic Languages and Literatures (3; max: 9)
GEW 6901—Special Study in Germanic Languages and Literatures (3; max: 9) Intensive study of a selected topic.
GEW 6905—Independent Study (3; max: 9) *Available by special arrangement.* May be taken only once for M.A. credit.
GEW 6910—Supervised Research (1-5; max 5) S/U.
GEW 6971—Research for Master's Thesis (1-9) S/U.
GEW 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.
GEW 7980—Research for Doctoral Dissertation (1-15) S/U.

Russian Language and Literature

RUW 5905—Special Studies in Russian (1-3; max: 12) *Available only by special arrangement.*

Scandinavian Languages

SCA 6755—Introduction to Old Norse-Icelandic (3) Its grammar, vocabulary, and selected features of style. Texts in prose.
SCA 6756—Readings in Old Norse-Icelandic Literature (3) *Prereq: SCA 6755.* Continuation of SCA 6755. Introduction to style of Old Norse-Icelandic verse text.

CENTER FOR GERONTOLOGICAL STUDIES
College of Liberal Arts and Sciences

Director: O. von Mering. *Associate Director:* R. West.

The Center has more than 130 associated faculty in departments throughout the campus. Cooperative agreements have been established with several departments to facilitate gerontology training of their students. These departments include Anthropology, Communication Processes and Disorders, Counselor Education, Health Services Administration, Physical Therapy, Psychology, Religion, and Sociology.

The Center for Gerontological Studies offers the Graduate Certificate in Gerontology for master's, specialist, and doctoral students in conjunction with graduate programs in several disciplines. The Center affords graduate students with backgrounds in different disciplines the opportunity to concentrate in gerontology through training that incorporates multidisciplinary instruction, field experience, and research activity. Graduate assistantships are available to highly qualified students who have been admitted to the graduate certificate program.

GEY 5935—Topics in Gerontology (3; max: 6)
GEY 6646—Issues and Concepts in Gerontology (3) A multidisciplinary, team-taught survey of the field.

Other courses with aging content are offered by faculty associates and listed in their primary disciplinary or professional department. A list of courses which may be used to fulfill the graduate certificate requirements in gerontology may be obtained from the Center, 3355 Turlington Hall, 392-2116.

HEALTH RELATED PROFESSIONS—GENERAL
College of Health Related Professions

Dean: R. R. Gutekunst.

The following courses are offered under the supervision of the office of the dean by an interdisciplinary faculty and deal with material of concern to two or more of the areas of specialty offered in the College of Health Related Professions. These courses are also open to students of other colleges, with the permission of the course instructor.

HSC 6905—Individual Study in Health Related Professions (2-4; max: 8)
HSC 6939—Special Topics (1-4; max: 8) S/U.
HSC 6940—Supervised Teaching (1-5; max: 5) S/U.

HEALTH SCIENCE EDUCATON
College of Health and Human Performance

GRADUATE FACULTY 1993-94
Chairperson: R. M. Pigg. *Graduate Coordinator:* B. A. Rienzo. *Professors:* S. W. Fagerberg; R. M. Pigg. *Associate Professors:* W. W. Chen; S. M. Dorman; B. A. Rienzo; J. W. Varnes.

At the master's level, the Department of Health Science Education offers a thesis degree, Master of Science in Health Science Education, with a specialization in research and evaluation, and a nonthesis degree, Master of Health Science Education, with specializations in school and college health education, public health education, and health promotion. The Department participates in the College's Ph.D. program in health and human performance by offering a specialization in health behavior. Graduate study prepares students for a variety of positions in health education and health promotion including college and university, community health, clinical, and corporate settings.

Applicants preferably should hold an undergraduate degree in health education or a closely related discipline, but applicants from other disciplines are considered as well. Deficiencies in undergraduate health education course work may be corrected concurrently with registration in graduate-level course work.

No graduate student may count more than six hours in HSC 5122, 5135, 5138, 5142, 5576, 6586, and 6635 toward the minimum requirements for the degree.

HLP 6515—Evaluation Procedures in Health and Human Performance (3) Evaluation and interpretation of tests and analysis of research data.
HLP 6535—Research Methods (3) Introduction to research methodology and design.
HLP 6911—Research Seminar (1; max: 6) Research presentations by graduate students and faculty in the College of Health and Human Performance. S/U.
HLP 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.
HLP 7980—Research for Doctoral Dissertation (1-15) S/U.
HSC 5125—Consumer Health Education (3) Health educator's role in areas such as awareness and detection of health fraud, identification and assessment of health information sources, development of consumer decision-making models, and strategies for consumer education. Not open to students who have completed HSC 3120.
HSC 5135—Emotional Health Education (3) Importance of emotional health in achieving optimal health; health educator's role in program development, supportive listening, and referral strategies for counseling; development of communication skills; common emotional health problems and concerns. Not open to students who have completed HSC 3134.
HSC 5138—Human Sexuality (3) Theory and practice, including psychosexual development, human reproduction, sexual relationships, dysfunction, therapy, legal and ethical issues, as well as teaching and facilitative techniques. Not open to students who have completed HSC 3133.
HSC 5142—Drug Education (3) Social, behavioral, environmental, and historical perspectives on substance abuse; content, issues, and instructional strategies appropriate for health education regarding alcohol, tobacco, and other drugs in school and community settings. Not open to students who have completed HSC 3140.
HSC 5576—Nutrition Education for Special Populations (3) Assessment of nutrition information needs for selected population groups; planning, implementation, and evaluation of nutrition education programs for school and community settings. Not open to students who have completed HSC 3574.
HSC 5925—Seminar in Health Science Education (1-6; max: 6)
HSC 6006—Philosophy and Principles of Health Science Education (3) History, philosophy, and ethics; theories of health behavior and principles of learning; areas of professional specialization; roles and functions of professional health educators; certification and continuing education; trends.
HSC 6235—Patient Health Education (3) Health education theory and principles applied to the primary health care setting, overview of agents and processes of disease with emphasis on program development for teaching protocols for specific diseases. Recent developments in patient education, e.g., out-patient programs and wellness centers.
HSC 6318—Advanced Methods of Health Science Education (3) Basic principles of health education for various community settings, and the use of communication media in joint planning for comprehensive health education.
HSC 6507—Epidemiology (3) Procedures used in study of origin, distribution, and control of chronic and communicable diseases; emphasis on role of health education interventions in disease control.
HSC 6567—Health Promotion and Programming in Gerontology (3) Planning, implementation, and evaluation of health maintenance and promotion programs for adult populations, with emphasis on the aging process.
HSC 6571—Contemporary Issues in Health Promotion (3) Emotional health, value systems, stress and depression, aging and death, drug abuse, physical fitness, weight control, consumer health, chronic and communicable diseases.
HSC 6586—Worksite Health Promotion (3) Procedures involved in planning, implementing, and evaluating comprehensive health promotion programs; factors in risk assessment and reduction; strategies and resources for employee health education; ethical issues in client relations. Not open to students who have completed HSC 4711.
HSC 6605—Scientific Foundations of Holistic Health (3) Examination and interpretation of the holistic principles which influence and modify the health potential of the individual and the community.
HSC 6635—Trends in International Health (3) Disease patterns and prevalence, contributing factors, organizational and governmental initiatives, and model programs; emphasis on problems amenable to health education interventions. Not open to students who have completed HSC 4650.
HSC 6850—Internship in Health Science Education (1-12; max: 12)
HSC 6904—Readings in Health Science Education (1-3; max: 6)
HSC 6905—Independent Study in Health Science Education (1-3; max: 6)
HSC 6910—Supervised Research (1-5; max: 5) S/U.
HSC 6935—Current Topics in Health Science Education (1-3; max: 6)
HSC 6940—Supervised Teaching (1-5; max: 5) S/U.
HSC 6971—Research for Master's Thesis (1-15) S/U.
HSC 7904—Advanced Readings in Health Science Education (1-3; max: 6)
HSC 7905—Advanced Independent Study in Health Science Education (1-3; max: 6)
HSC 7937—Advanced Seminar in Health Science Education (1-3; max: 6)
PHC 6105—Organization and Administration of Public Health Programs (3) Structure and function of local, state, and federal programs, including official agencies, voluntary agencies, and health-related private sector activities in relation to current emphases on health promotion and chronic disease control.

HEALTH SERVICES ADMINISTRATION
College of Health Related Professions

GRADUATE FACULTY 1993-94

Chairman: B. R. Greene. *Graduate Coordinator:* B. L. Orban. *Professors:* B. R. Greene; R. P. Duncan. *Associate Professors:* L. C. Gapenski; B. L. Orban; W. B. Vogel.

The Department of Health Services Administration offers the following courses as part of the graduate program in health and hospital administration, a dual degree program leading to Master of Business Administration and Master of Health Science degrees. Requirements for the program are described more fully in the sections of this *Catalog* dealing with requirements for the *Master of Business Administration and Master of Health Science.*

For admission to courses listed below, the student must have been admitted to the Graduate School, College of Business Administration, and to the Department of Health Services Administration.

HSA 5426—Legal Aspects of Health Service Administration (3) Legal liability, corporate theory, and special legal problems in the health care field.
HSA 6126—Perspectives in Health Services Administration (3) An examination of the character and purpose of the provision of health services in the United States. Particular attention is directed to planning, organization, financing, and delivery of personal health services.
HSA 6149—Seminar in Health and Hospital Administration (1; max: 2) Formal study, through readings, lectures, field trips, and case discussions of current issues in health services administration. H
HSA 6152—Health Policy and Health Services Administration (3) *Prereq: HSA 6126, 6206, 6188.* Orientation to and analysis of

private, federal, state, and local policy processes and policies as they relate to health services in the United States and selected countries.

HSA 6176—Healthcare Financial Management (3) *Prereq: ACG 5005, FIN 5405.* Application of corporate finance concepts and principles to healthcare organizations.

HSA 6188—Strategic Management in Health Services Administration (2) *Prereq: HSA 6126, 6206.* Relationship of health care organizations to their environment. Strategic management processes, problem solving structures, and perspectives to aid in addressing key issues in health care organizations.

HSA 6206—Health Services Organizations (3) Overview of mission, environment, organizational design, and strategy in health services organizations, including hospital, ambulatory care, and long term care settings.

HSA 6216—Ambulatory Care and Alternative Delivery Systems (2) An analysis of management issues in the delivery of ambulatory medical care and various alternative delivery systems.

HSA 6407—Health and Disease (2) Examination of conceptual issues in defining and measuring health, illness, and disease, with an emphasis on the social and cultural dimensions of these concepts.

HSA 6758—Quality Assurance in Health Care Organizations (3) Analysis of theory, method and practices of quality assessment and assurance in various health care settings.

HSA 6876—Residency in Health and Hospital Administration (1-6; max: 6) A minimum of six months' supervised field work in an administrative setting. S/U.

HSA 6906—Individual Study in Hospital Administration (1-3; max: 6)

HSA 6934—Special Topics in Health Services Administration (1-3; max: 6) Selected topics in theory and research in health services administration.

HISTORY
College of Liberal Arts and Sciences

GRADUATE FACULTY 1993-94

Chairman: F. G. Gregory. *Graduate Coordinator:* T. W. Gallant. *Graduate Research Professors:* M. MacLeod; D. Rutman; W. Woodruff. *Richard Milbauer Professor:* B. Wyatt-Brown. *Distinguished Service Professors:* D. M. Chalmers; M. V. Gannon; S. Proctor. *Professors:* D. R. Colburn; R. H. Davis, Jr.; H. J. Doherty; S. Feierman; R. Formisano; F. G. Gregory; J. V. Lombardi; S. A. McKnight; R. J. McMahon; H. W. Paul; G. E. Pozzetta; C. F. Sidman; C. J. Sommerville; C. C. Sturgill; R. Zieger. *Associate Professors:* J. Adler; A. F. Blakey; A. M. Burns; S. S. Conroy; M. L. Entner; T. W. Gallant; D. P. Geggus; G. J. Giles; R. A. Hatch; C. L. Lansing; J. Needell; J. M. Pleasants; D. J. Schroeter; H. A. Wilson. *Assistant Professors:* S. R. Grossbart; G. S. Henry; E. A. McCord; V. Smocovitis; J. C. Tribby; E. R. Turner.

The Department of History offers the following graduate degrees: (1) Master of Arts with fields of concentration in African, East Asian, Medieval, European, Latin American, and United States history, the history of science, and public history; and (2) Doctor of Philosophy with fields of concentration in Latin American, African, European, and United States history and the history of science.

In addition to materials required by the Graduate School for admission, applicants must send directly to the History Department the following evidence of aptitude and interest: (1) three recommendations from persons competent to evaluate their potential for graduate work; (2) an essay of from three to five double-spaced typewritten pages identifying their career goals and particular regional, temporal, or topical interests within the general field of history.

In addition to meeting the general requirements of the Graduate School for graduation, candidates for all graduate degrees in history must have demonstrated a reading knowledge of at least one foreign language and completed one course in Schools of Historical Thought. The particular requirements for each degree are listed below.

Master of Arts.—*Thesis option:* (1) At least 12 graduate-level regular course credit hours in the major field, including the required readings seminars; (2) at least 9 graduate-level regular course credit hours in the Department of History from areas outside the major field; (3) 6 graduate-level credit hours in historical methods and theory ; (4) at least 6 regular course credit hours (at the 3000-level or higher) from outside the Department; (5) for thesis students, in addition to the 33 regular course credit hours outlined above, at least 3 credits of HIS 6971—Research for Master's Thesis must be taken in the final term; (6) each thesis student must pass a final, comprehensive oral examination, conducted by the supervisory committee, on the thesis, the major subjects, the minor subjects, and matters of a general nature pertaining to the field of study. *Nonthesis option:* (1) through (4) as outlined above except 33 credit hours must be letter graded; (5) at least one research seminar course, defined below, should be included in the 33 letter-graded credit hours; (6) a final comprehensive written examination, conducted by the supervisory committee, on the major and minor fields of study must be passed as well as an oral examination. A research seminar is a course in which the student's primary goal will be the successful completion of a journal-length essay (approximately 35-40 pages) of publishable or near-publishable quality. The essay should be based largely on primary sources.

Doctor of Philosophy.—(1) A professional competence in the field of concentration designed as the major field; (2) a knowledge of two minor fields, one of which must be drawn from the approved major fields of concentration for the doctorate (Latin American, European, African, U.S. history and the history of science), and the other being thematic in nature and including at least 6 hours outside the Department; (3) completion of HIS 6060; (4) passage of a set of written and oral qualifying examinations testing competence in major and additional fields as well as the student's knowledge of the nature of history and the historian's task; (5) a dissertation for which credit is given in HIS 7980. Students may also take an optional third area in public history.

History/Law Joint Degree Program.—The Department of History and the College of Law offer a concurrent degree program in legal history leading to a doctoral degree in history and a juris doctorate in law. Because the faculties of history and law stress interdisciplinary training, students admitted to the joint degree program will be allowed to count a significant number of hours toward both degrees. Application to the two programs must be simultaneous, and the applicants must be accepted by both the Graduate School and the College of Law. Normally, students will complete the course and examination requirements of both

degrees in four years. The program offers students work in the legal and constitutional history of the United States (especially the South), England, Europe, and Latin America. Students may begin their first year of work in either history or law, but they must complete the first year of law school within one year and they must do so within the first two years of admission to the joint degree program.

For further information write to the Graduate Coordinator, Department of History, 4131 Turlington Hall.

AFH 5125—Pre-Colonial Africa (3) Selected topics in the history of Africa before the colonial period. Not open to students who have taken AFH 4120 or equivalent.

AFH 5258—Modern Africa (4) *Prereq: permission of instructor.* Selected topics in nineteenth and twentieth-century African history. Not open to students who have taken AFH 4250 or equivalent.

AFH 5296—Health and Healing in Modern Africa (3) *Prereq: consent of instructor.* Health and healing as structured by changing patterns of everyday life on the African continent in the nineteenth and twentieth centuries. Not open to students who have taken AFH 4292 or the equivalent.

AFH 5297—History of African Agriculture (3) Beginning with the transition to agriculture and continuing through an examination of African agriculture in the post-colonial period. Not open to students who have taken AFH 4291 or the equivalent.

AFH 5348—History of West Africa (4) Ghana empire to the contemporary period. Not open to students who have taken AFH 3342 or equivalent.

AFH 5406—History of East Africa (3) Society, culture, and ecology in East Africa from the early period to the present. Not open to students who have taken AFH 4405 or the equivalent.

AFH 5458—Southern Africa (4) *Prereq: permission of instructor.* History of Africa south of the Zambezi River since 1800, with special reference to the Republic of South Africa. Not open to students who have taken AFH 4450 or equivalent.

AFH 5934—Topics in African History (3; max: 9)

AFH 6103—Seminar in Pre-Colonial Africa (3; max: 6)

AFH 6259—Seminar in Modern Africa (3; max: 6)

AFH 6805—Historiography of Africa (3) Changing trends in the writing of African history in Africa, Europe, and North America.

AFH 6934—Africa (4)

AFH 6936—Readings in African History (3; max: 6)

AMH 5116—Early America (4) Origin and development of an American society along the eastern seaboard of North America. Not open to students who have taken AMH 4110.

AMH 5137—American Revolutionary Era (4) *Prereq: permission of instructor.* The Great War for Empire, the origins and course of the War for American Independence, government under the Articles of Confederation, and the movement for constitutional revision. Not open to students who have taken AMH 4130 or equivalent.

AMH 5177—Era of the American Civil War (4) *Prereq: permission of instructor.* American history in the 1850s, 1860s, and 1870s with special attention to the Civil War. Not open to students who have taken AMH 4172 or equivalent.

AMH 5229—Populist Era to World War I (4) *Prereq: permission of instructor.* Turn of the century decades from which the basic patterns of modern American industrial society and America's world power role emerged. Not open to students who have taken AMH 4220 or equivalent.

AMH 5239—The United States, World War I to World War II (4) *Prereq: permission of instructor.* Political, economic, and social history of the U.S. between the wars with particular attention to the conflict between fundamentalism and modernism in the 1920s and the Great Depression. Not open to students who have taken AMH 4231 or equivalent.

AMH 5278—The United States Since World War II (4) *Prereq: permission of instructor.* Changes in American society and in America's role in world affairs from 1945 to the present. Not open to students who have taken AMH 4270 or equivalent.

AMH 5404—The South to 1860 (4) *Prereq: permission of instructor.* Development of the South from colonial times to the emergence of southern nationalism. Not open to students who have taken AMH 4402 or equivalent.

AMH 5405—The South Since 1860 (4) *Prereq: permission of the instructor.* History of the South from the Civil War to the present, emphasizing the South as an integral region and its relationship to the rest of the nation. Not open to students who have taken AMH 4403 or equivalent.

AMH 5547—American Military History and Policy (3) *Prereq: permission of instructor.* Study of the American military establishment from colonial times to present.

AMH 5905—Special Studies (3; max: 12 including HIS 6905)

AMH 5930—Topics in United States History (3; max: 9)

AMH 6148—The Literature of United States History (4) Main themes and issues in contemporary writing about United States history.

AMH 6198—Early American Society (4) A research seminar focusing on a selected topic or selected topics in American history through the War of 1812.

AMH 6199—Nineteenth Century America (4) A research seminar focusing on a topic or topics in American history from the War of 1812 to around 1900.

AMH 6290—Modern America (4) A research seminar focusing on a topic or topics in American history in the twentieth century.

AMH 6356—Research Seminar in U.S. Political History (4) Reading and research designed to produce a paper which demonstrates ability to do research in primary sources and connect original work with existing historical literature.

AMH 6379—The United States in the World Economy, 1783-1980 (4)

AMH 6393—Seminar in American Thought (4)

AMH 6406—Readings in Southern History, 1607-1865 (4) An analysis of the major scholarly works and interpretations dealing with the development of a bi-racial society in the American South.

AMH 6465—Seminar in U.S. Urban History (4) Historical development of American cities and ways in which the urbanization process has reshaped social life.

AMH 6498—Seminar in U.S. Immigration and Ethnicity (4) Analysis of impact of immigration and ethnicity on creation of pluralist American society.

AMH 6499—Historical Analysis of the American Community (4) Local history with focus on the American community from colonial origins to the present.

AMH 6506—Seminar in American Labor History (4)

AMH 6516—Seminar in American Foreign Relations and Expansion (4) American foreign policy since 1945, the United States response to Third World nationalism, the changing historiographical debate over the nature of U.S. diplomacy, and other selected topics.

AMH 6557—Seminar in the Constitutional and Legal History of the United States (4) A chronological and thematic analysis of the evolution of American law, legal institutions, and constitutionalism from their English origins to the present.

ASH 5388—Topics in East Asian History (3; max: 9)

ASH 6904—Readings in Japanese History (3; max: 9)

EUH 5225—Expansion of Europe: Exploration and Settlement, 1415-1650 (3) *Prereq: permission of instructor.* European expansion overseas, 1415-1650; impact of Africa, Asia, the Americas; the development of a global economy. Not open to students who have taken EUH 4220 or equivalent.

EUH 5447—France (4) *Prereq: permission of instructor.* Topics in the history of France from the Middle Ages to the present. Not open to students who have taken EUH 4442 or equivalent.

EUH 5467—Germany: The Making of the Empire (4) *Prereq: permission of instructor.* Formation of the German Empire under Chancellor Bismarck and Kaiser Wilhelm II. Not open to students who have taken EUH 4463 or equivalent.

EUH 5468—Germany: The Republic and the Third Reich (4) *Prereq: permission of instructor.* History of Germany from the 1930s through World War II, emphasizing the methods by which Hitler gained and maintained power. Not open to students who have taken EUH 4464 or equivalent.

EUH 5517—Elizabethan England, 1509-1660 (4) Topics in English history from the reign of Elizabeth through the restoration of

the Stuarts. Not open to students who have taken EUH 4511 or equivalent.
EUH 5519—Restoration England, 1660-1793 (4) Topics in English history from the Stuart Restoration through the reign of George III. Not open to students who have taken EUH 4513 or equivalent.
EUH 5546—Topics in British History (3; max: 9)
EUH 5612—Gender and Power in the West (3) Examination of cultural constructions of femininity and masculinity and male and female sexuality in the western world to analyze relationships between gender and power. Weekly investigations of the dynamics of power in a given period or society to determine how gendered definitions reflected or changed political relationships.
EUH 5657—European Military History (4) *Prereq: permission of instructor.* Topics in European military history with emphasis on the seventeenth and eighteenth centuries. Not open to students who have taken EUH 4650 or equivalent.
EUH 5934—Topics in European History (3; max: 9)
EUH 6126—The Middle Ages (4)
EUH 6213—Europe, 1500-1763 (4)
EUH 6289—Readings, Modern Europe (3; max: 6)
EUH 6342—Europe Since 1763 (4)
EUH 6469—Modern German History (4) Interpretations of and approaches to German history, and introduction to advanced research in the area.
EUH 6508—England (4)
HIS 5055—Topics in Public History (3; max: 6)
HIS 5445—Social History and Social Science (3) Examines the evidence, techniques, interpretations of historians who use quantitative methods in the study of social issues.
HIS 5450—Slavery in the New World: Comparative Perspectives (4) Examines in-depth the evolution of slavery in the New World from its European and African antecedents through abolition and emancipation.
HIS 5461—Studies in Ancient and Medieval Science (4) Topical approach to origins of science from the second millennium B.C. to rebirth of classical thought in fifteenth century. Topics derive primarily from Hellenic and Hellenistic Greece; focus on works of Aristotle, Galen, Ptolemy, their principal contemporaries, and later Islamic and Latin followers.
HIS 5480—The Scientific Revolution (4) Emergence of modern science from Copernicus to Newton, exploring the notions of empiricism, experiment, mechanism, materialism, and the historical concepts of continuity, change, revolution, and progress. Emphasis on conceptual analysis of primary text material.
HIS 5484—Science and the Enlightenment (4) Theoretical developments in the physical and biological sciences between the late seventeenth and late eighteenth centuries, including significance of social and cultural dimensions of natural science.
HIS 5485—Special Studies in the History of Science (3; max: 6)
HIS 5487—Physical Science Since 1800 (4) Major developments in physical science from beginning of nineteenth century to post-World War II period. Institutional and social aspects of organization of scientific research.
HIS 5500—Life Science Since 1800 (4) Critical problems of concern to biologists. Role of mechanistic/materialistic vs. vitalistic and reductionistic vs. holistic approaches to development of biology, as well as relationship of biology to physical and social sciences.
HIS 6060—Historical Method (3) Introduction to the methods of research used by professional historians.
HIS 6061—Introduction to Historiography (3) Development of schools, theories, and philosophies of history since the Enlightenment.
HIS 6063—Introduction to Quantitative History (3)
HIS 6077—Seminar in Oral History (4) Methods of oral history and their application.
HIS 6084—History, Philosophy, and Purposes of Museums (3)
HIS 6309—Research Seminar in Comparative Military History (4; max: 8) Relationship of the military in western society is studied through a multinational approach in selected topical areas.
HIS 6481—Pre-Newtonian Sciences (4) Physical and life sciences; may cut across chronological, geographical, and disciplinary boundaries.
HIS 6482—Modern Physical Science (4; max: 8) *Prereq: HIS 5500 or permission of instructor.* Issues surrounding individual episodes from history of physics and/or chemistry in post-Newtonian era.
HIS 6486—Seminar: Modern Biological Science (4; max: 8) *Prereq: HIS 5500 or permission of instructor.* Themes and issues in history of modern biological thought. Persistent controversies in evolutionary theory such as nature of selection, units of selection, evolutionary rates, and relationship of macroevolution to microevolution. Emphasis on close reading of *On the Origin of the Species* and other texts.
HIS 6488—Readings in the History of Science (1-4; max: 4) Inquiry into development of western scientific thought and institutions. Specific historical topics having intellectual coherence and substantial historiography.
HIS 6905—Individual Study (1-4; max: 12 including AMH 5905)
HIS 6910—Supervised Research (1-5; max: 5) S/U.
HIS 6940—Supervised Teaching (1-5; max: 5) S/U.
HIS 6943—Internship in College Teaching (2,4,6; max: 6)
HIS 6950—Practicum in Public History (1-6; max: 6) S/U.
HIS 6971—Research for Master's Thesis (1-15) S/U.
HIS 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.
HIS 7980—Research for Doctoral Dissertation (1-15) S/U.
LAH 5438—Modern Mexico (4) *Prereq: permission of the instructor.* Topics in Mexican history from independence in 1821 to the present with emphasis on the Diaz dictatorship and the Mexican Revolution. Not open to students who have taken LAH 4433 or equivalent.
LAH 5475—The Caribbean, Nineteenth and Twentieth Centuries (4) *Prereq: permission of instructor.* Development of the Hispanic and non-Hispanic Caribbean with emphasis on events since 1930. Not open to students who have taken LAH 4472 or equivalent.
LAH 5476—Caribbean History to 1800 (3) *Prereq: permission of instructor.* Social, economic, and political history of the West Indies and Circumcaribbean region to around 1800, emphasis on slave societies. Not open to students who have taken LAH 4471 or equivalent.
LAH 5527—Gran Colombian Nations (4) *Prereq: permission of instructor.* Comparative study of the patterns of political, cultural and socioeconomic development in Colombia, Venezuela, and Ecuador from independence to the present. Not open to students who have taken LAH 4520 or equivalent.
LAH 5627—Brazil to 1750 (4) *Prereq: permission of instructor.* Development of Portuguese society in South America and the origins of the Brazilian nation. Not open to students who have taken LAH 4620 or equivalent.
LAH 5637—Brazil Since 1750 (4) *Prereq: permission of instructor.* History of Brazil since independence with emphasis on the uniqueness of the nation and its internal diversity. Not open to students who have taken LAH 4630 or equivalent.
LAH 5934—Topics in Latin American History (3; max: 9)
LAH 6934—Seminar in Colonial Spanish America (4; max: 8)
LAH 6936—Seminar in History of Brazil (4)
LAH 6938—Seminar in Modern Spanish America (4)

HORTICULTURAL SCIENCE
College of Agriculture

GRADUATE FACULTY 1993-94

HOS Coordinator: D. J. Cantliffe. *Environmental Horticulture Chair:* T. A. Nell. *Graduate Coordinator:* C. L. Guy. *Horticultural Sciences Chair:* D. J. Cantliffe. *Graduate Coordinator:* J. K. Brecht. *Graduate Research Professor:* I. K. Vasil. *Professors:* L. G. Albrigo; L. H. Allen; C. E. Arnold; J. E. Barrett; M. J. Bassett; H. H. Bryan; D. J. Cantliffe; W. J.

Carpenter; W. S. Castle; N. F. Childers; C. A. Conover; T. E. Crocker; F. S. Davies; B. Dehgan; A. E. Dudeck; G. W. Elmstrom; R. J. Ferl; D. J. Gray; L. C. Hannah; B. K. Harbaugh; R. W. Henley; R. J. Henny; G. J. Hochmuth; D. J. Huber; M. A. Ismail; L. K. Jackson; W. J. Kender; K. E. Koch; R. E. Litz; S. J. Locascio; P. M. Lyrene; J. D. Martsolf; D. N. Maynard; D. B. McConnell; G. A. Moore; T. A. Nell; L. R. Parsons; J. W. Scott; T. J. Sheehan *(Emeritus)*; W. B. Sherman; M. Singh; W. M. Stall; R. H. Stamps; P. J. Stoffella; J. P. Syvertsen; W. F. Wardowski; W. E. Waters; T. A. Wheaton; G. J. Wilfret; T. H. Yeager. *Associate Professors:* P. C. Andersen; T. A. Bewick; C. H. Blazquez; J. K. Brecht; J. K. Burns; P. Busey; C. K. Chandler; C. D. Chase; K. C. Cline; A. A. Csizinszky; R. L. Darnell; T. L. Davenport; J. A. Dusky; E. J. Echeverria; D. M. Eissenstat; J. J. Ferguson; E. F. Gilman; J. P. Gilreath; F. G. Gmitter; J. W. Grosser; C. L. Guy; M. E. Kane; S. R. Kostewicz; D. R. McCarty; R. T. Nagata; J. G. Norcini; L. B. McCarty; A. W. Meerow; S. K. O'Hair; S. M. Olson; S. A. Sargent; B. A. Schaffer; J. R. Shumaker; C. E. Vallejos; S. D. Verkade; J. M. White; J. G. Williamson; J. G. Williamson. *Assistant Professors:* C. K. Chandler; R. L. Darnell; K. R. Narayanan; B. T. Scully; C. S. Vavrina.

The Departments of Environmental Horticulture and Horticultural Sciences offer a joint program in horticultural science leading to the Master of Agriculture, Master of Science, and Doctor of Philosophy degrees, with specialization in fruit crops, environmental horticulture, or vegetable crops.

Areas of emphasis include crop physiology and biochemistry, seed physiology, crop breeding and genetics, environmental science, crop production and management, landscape horticulture, postharvest physiology, biochemistry, and handling and horticultural taxonomy.

New graduate students should have undergraduate training in horticulture or plant science which should include credits in fruit crops, environmental horticulture, vegetable crops, or general horticulture and botany, mathematics, chemistry, soils, entomology, and plant pathology or equivalent. Student interest and available guidance and facilities will determine the area of emphasis within a given specialization for the thesis or dissertation problem. It is possible to conduct certain types of research for the Master of Science and Doctor of Philosophy degrees at one of the Agricultural Research and Education Centers of the Institute of Food and Agricultural Sciences.

HOS 5325C—Citrus Fresh Fruit Technology (3) *Prereq: BOT 3503 or equivalent.* Fresh citrus fruit physiology, pathology, handling, engineering principles, quarantine measures and regulations. Offered alternate even-numbered years in spring at Lake Alfred CREC.

HOS 5330—Commercial Harvesting and Postharvest Handling of Horticultural Crops (1) Intensive study of current technological procedures used in the harvesting and handling of vegetables, fruits, and ornamentals in Florida. Offered in spring.

HOS 5544C—Citrus Production, Handling, and Research in Florida (4) *Prereq: FRC 3212 or 4223, or equivalent.* Current practices and related research in production, harvesting, and handling Florida citrus. Offered alternate odd-numbered years in summer at Lake Alfred CREC.

HOS 5555—Tropical Fruit Production and Research in Florida (3) A comprehensive study at the Tropical Research and Education Center at Homestead and field locations in South Florida. (Students will be in residence for four weeks at the Center.) Offered alternate even-numbered years in summer.

HOS 5616—Agricultural Meteorology (2) Weather and climate as they relate to agriculture; atmospheric radiation, macro- and micro-meteorology, evapotranspiration, and remote sensing and its application to agriculture. Offered alternate even-numbered years in spring.

HOS 6116C—Developmental Morphology of Flowering Plants (3) *Prereq: BOT 3303C.* Developmental morphology of the vegetative and reproductive organs of flowering plants with particular emphasis on form and function as revealed by recent experimental techniques. Offered alternate even-numbered years in spring.

HOS 6136C—Morphology and Taxonomy of Horticultural Crops (4) *Prereq: BOT 3303 and 5225 or equivalent.* Morphological characteristics of horticultural crops in relation to taxonomic principles with emphasis on the scientific basis and utility of the various systematic methods. Offered alternate odd-numbered years in fall.

HOS 6201—Breeding Perennial Cultivars (3) *Prereq: AGR 3303.* Methods of breeding perennial fruit and ornamental cultivars using mutations, cell and tissue culture, polyploidy, wide hybridization, and recurrent selection. The conservation and domestication of wild plants. Offered alternate odd-numbered years in fall.

HOS 6231—Biochemical Genetics of Higher Plants (3) *Prereq: AGR 3303 or PCB 3063 or equivalents.* Discussion of current evidence bearing on gene function and regulation, examples of the use of plant mutants in the elucidation of biochemical pathways, and examination of somatic cell genetics in higher plants. Offered alternate even-numbered years in spring.

HOS 6242—Genetics and Breeding of Vegetable Crops (3) *Prereq: AGR 3303.* Techniques for genetic analysis of quantitative characters and applied aspects of vegetable breeding. Offered alternate even-numbered years in fall.

HOS 6262—Physiological Genetics of Higher Plants (3) Genetic control of physiological processes—metabolism, growth and development, and responses to the environment. Offered alternate odd numbered years in fall.

HOS 6311—Seed Physiology (3) *Prereq: BOT 3503.* Study of the dormancy, germination, growth, and development of seeds and the life processes involved; methods of handling and processing. Offered alternate even-numbered years in fall.

HOS 6331—Postharvest Physiology (3) *Prereq: BOT 3503 and VEC 4452, ORH 4263 or equivalent.* Physiological and biochemical principles involved in quality maintenance and postharvest handling of fruit, vegetable, and ornamental crops. Emphasis on phases of development known as maturation, ripening, and senescence. Current theories and research reviewed with emphasis on understanding and control of cellular processes important to storage and quality maintenance of horticultural commodities. Offered alternate odd-numbered years in spring.

HOS 6345—Environmental Physiology of Horticultural Crops (3) *Prereq: BOT 3503 and consent of instructor.* Horticultural crop physiology from a whole-plant viewpoint. Influence of environmental factors on photosynthesis, water movement, translocation, fruit set and yields. Offered alternate even-numbered years in fall.

HOS 6351—Chemical Regulators of Horticultural Crops (3) Physiology and biochemistry of chemical regulators as related to horticultural crops, with emphasis on manipulative practices. Offered alternate odd-numbered years in fall.

HOS 6373C—Methods and Applications of Plant Cell and Tissue Culture (3) *Prereq: HOS 6116C.* Laboratory techniques for the culture of plant protoplasts, cells, tissues, and organs, and their applications in the study of cellular differentiation, development, genetics, and agriculture. Offered alternate even-numbered years in spring.

HOS 6412—Nutrition of Horticultural Crops (3) *Prereq: BOT 3503 and ORH 4411 or equivalent.* Physiological, biochemical and environmental factors influencing nutritional status of horticultural plants and the resulting effects on growth, yield, and quality. Offered alternate odd-numbered years in spring.
HOS 6523—Research and Development in Turfgrass Science (3) *Prereq: ORH 3222.* Principles and practices of turfgrass improvement and management, including propagation, nutrition, physiology, soil management, and experimental methods applied to turf research. Offered alternate even-numbered years in spring.
HOS 6535—Advanced Pomology (2) Principles of rootstock-scion relationships, growth regulators, dormancy, flowering, fruiting, and crop evolution. Offered alternate even-numbered years in fall.
HOS 6545—Citriculture I (3) *Prereq: FRC 3212 and 4223, HOS 5544 or equivalent.* Regulation of citrus vegetative growth including climactic, physiological, and cultural factors. Offered alternate odd-numbered years in fall at Lake Alfred CREC.
HOS 6546—Citriculture II (3) *Prereq: FRC 3212 and 4223, HOS 5544 or equivalent.* Factors regulating flowering, fruit development and alternate bearing of citrus. Offered alternate even-numbered years in spring at Lake Alfred CREC.
HOS 6565—Advanced Olericulture (3) *Prereq: BOT 3503.* Survey of scientific knowledge related to production of vegetable crops. Offered alternate odd-numbered years in fall.
HOS 6767—Advanced Plant Metabolism (3) *Prereq: BOT 6516.* Regulation of intermediary metabolism, nitrate/sulfate assimilation, biosynthesis of ureides, polyamines, chlorophyll, secondary metabolites, and protein turnover mechanisms. Offered alternate odd-numbered years in spring.
HOS 6905—Problems in Horticultural Science (1-4; max: 8) H.
HOS 6910—Supervised Research (1-5; max: 5) S/U.
HOS 6929—Plant Physiology Colloquium (1; max: 3) Topics in plant physiology including historical aspects, key papers, research approaches, and hypotheses concerning important areas of current research. Offered in spring.
HOS 6931—Horticultural Science Seminar (1; max: 3) Oral presentation of material in one of the following areas: literature review related to student's research, research results, or published paper of relevance to horticulture. Subject matter determined by instructor. S/U. Offered in fall and spring.
HOS 6932—Topics (1-4; max: 8) Study of contemporary research in horticultural science.
HOS 6940—Supervised Teaching (1-5; max: 5) S/U.
HOS 6941—Practicum in Horticultural Science (2-4; max: 8) Admission limited to graduate students majoring in horticultural science. Supervised and individual work in professional areas of horticulture.
HOS 6971—Research for Master's Thesis (1-15) S/U.
HOS 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.
HOS 7980—Research for Doctoral Dissertation (1-15) S/U.
PCB 5065—Principles of Genetics (3) *Prereq: AGR 3303 or PCB 3063 or equivalent.* Basic and advanced principles taught through presentation of classical and current literature. Characterization, regulation, and mutation of genes, transmission, recombination and linkage, extranuclear, developmental, quantitative, and population genetics. Offered in fall.

IMMUNOLOGY AND MEDICAL MICROBIOLOGY
College of Medicine

GRADUATE FACULTY 1993-94

Chairman: R. W. Moyer. *Graduate Coordinator:* R. C. Condit. *Graduate Research Professor:* A. S. Bleiweis. *Eminent Scholars:* D. J. Barrett; W. J. Hauswirth. *Professors:* E. M. Ayoub; R. C. Condit; R. B. Crandall; D. H. Duckworth; J. B. Flanegan; E. P. Gibbs; R. R. Gutekunst; L. O. Ingram; A. S. Lewin; J. E. McGuigan; R. W. Moyer; S. A. Moyer; J. T. Neilson; J. W. Shands; P. A. Small; C. B. Walker; R. S. Weiner; M. D. Young. *Associate Professors:* R. Lottenberg; R. Ramphal; K. H. Rand; J. R. Zucali. *Assistant Professors:* D. J. Driscoll; J. L. Schiffenbauer; M. S. Swanson.

The Department of Immunology and Medical Microbiology offers a program leading to the Doctor of Philosophy degree in medical sciences. Areas of specialization include molecular genetics, virology, cellular and humoral immunity, parasitology, bacteriology, and molecular pathogenesis.

The undergraduate preparation for graduate study should be wide in scope and should include general biology, physics, chemistry (two to three years, including organic and physical chemistry), and preferably statistics, calculus, biochemistry, genetics, and bacteriology. A bachelor's degree in bacteriology or microbiology is not required. In graduate school the student will at first obtain a general background in microbiology as preparation for research and teaching. The graduate student is given the opportunity to participate in research in the first year via rotations in three laboratory groups. The remaining course work should be arranged according to the student's interests and competence. Through individual planning of course work, research, and teaching, the graduate student is offered an educational atmosphere to help develop certain skills and gain intellectual independence and initiative.

GMS 6107—Virology (3) *Prereq: working knowledge of molecular biology.* Molecular biologic and genetic aspects of virus structure, gene expression, replication, and interaction with host cell. Emphasis on DNA and RNA animal viruses.
GMS 6121—Infectious Diseases (3) *Prereq: GMS 6140, 6152, permission of instructor.* Survey of medical microbiology directed at understanding infectious disease in terms of molecular pathogenesis, bacterial physiology, and genetics.
GMS 6140—Principles of Immunology (3-5; max: 5) Comprehensive description of molecular and cellular mechanisms involved in development of immunity and disease resistance. Basic concepts in immunology presented through descriptions of experimental results. Emphasis on developing ability to evaluate and interpret experimental data.
GMS 6152—Molecular Genetics (3-5; max: 5) Molecular processes of genetic transmission: DNA synthesis, transcription, and translation; recombination and transposition; RNA structure and processing; regulation of gene expression. Genetic mechanisms of both prokaryotic and eukaryotic organisms. Primary research literature.
GMS 6181—Special Topics in Microbiology (1-6; max: 18)
GMS 6190—Seminar (1; max: 12) Presentations by invited speakers. S/U.
GMS 7191—Research Conference (1; max: 12) Critical discussion and appraisal of research programs of faculty and students of the department. S/U.
GMS 7192—Journal Colloquy (1; max: 12) Critical presentation and discussion of recent original articles in the microbiological literature. S/U.

INDUSTRIAL AND SYSTEMS ENGINEERING
College of Engineering

GRADUATE FACULTY 1993-94

Chairman: D. J. Elzinga. *Graduate Coordinator:* B. D. Sivazlian. *Professors:* J. F. Burns; B. L. Capehart; D. J. Elzinga; R. L. Francis; D. W. Hearn; R. S. Leavenworth *(Emeritus)*; J. F. Mahoney; E. J. Muth *(Emeritus)*; J. A. Nattress *(Emeritus)*; B. D. Sivazlian; R. W. Swain; D. B. Wilcox *(Emeritus)*. *Associate Professors:* C. Y. Lee; S. Tufekci; S. Yeralan. *Associate Engineer:* K. E. Dominiak.

The Department of Industrial and Systems Engineering offers the Master of Engineering and the Master of Science, each with a thesis or nonthesis option, with specialization in engineering management, manufacturing systems engineering, operations research, quality and reliability assurance, and health systems. In addition, the Department offers the Engineer degree and the Doctor of Philosophy degree with specialization in industrial engineering, operations research, and systems engineering.

A degree in one of the engineering disciplines or in mathematics, statistics, physics, computer sciences, quantitative management, or similar fields is prerequisite. Where the student's background is deficient, an articulation program of foundation courses will be required.

EIN 6246L—Human Factors Engineering (2) *Prereq: course in human engineering or perceptual psychology.* Effects of human factors on the performance of systems containing extensive man-machine interactions.

EIN 6318—Work Measurement Theory (3) *Prereq: EIN 3314L, ESI 6417, STA 4321.* Systems of work measurement and work methods. Comparison of systems.

EIN 6336—Advanced Production and Inventory Control (3) *Prereq: ESI 6417, 6429.* Production planning and control; problem identification and formulation. Mathematical theory of single- and multicommodity inventory systems; problem solving using dynamic programming and Markov chains.

EIN 6357—Advanced Engineering Economy (3) *Prereq: STA 4321.* Economic analysis of capital expenditure decisions. Financial mathematics and microeconomics. Decision under risk and uncertainty. Game theory and utility theory.

EIN 6358—Decision Theory (2) *Prereq: EIN 6357, ESI 6417.* Formulation of decision criteria and decision strategies in a probabilistic environment. Industrial applications of input-output analysis and von Neumann-Morgenstern utility theory. Statistical decision functions.

EIN 6367—Facilities Layout and Location (3) *Prereq: ESI 6417.* Planar and discrete layout problems and locations problems; network location problems. Single- and multi-objectives. Industrial and public sector applications.

EIN 6388—Statistical Forecasting Models (3) *Prereq: ESI 4567, STA 4322.* Classification of models for forecasting; polynominal and autoregressive models; the problem of smoothing; cross-correlation and its use; the Box-Jenkins method; estimation of model parameters; forecast error; analysis of industrial data.

EIN 6392—Manufacturing Management (3) *Prereq: ESI 6314 and undergraduate probability and statistics.* Variety and importance of management decisions. Total quality management, just-in time manufacturing, concurrent engineering, material requirements planning, production scheduling, and inventory control.

EIN 6397—Seminar in Manufacturing Systems Engineering (1-2; max: 5) Current topics in manufacturing. Automation, robotics, computer vision, communication networks, labor relations, manufacturing processes.

EIN 6508—Health Systems Analysis (3) *Prereq: consent of instructor.* Introduction to quantitative analysis, total value analysis, resource allocation techniques, stochastic service systems, simulation, quality of care audits, and hospital control and management systems.

EIN 6905—Special Problems (1-6; max: 9) Laboratory, lecture, field work, or conferences.

EIN 6910—Supervised Research (1-5; max: 5) S/U.

EIN 6918—Graduate Seminar (1; max: 15) S/U.

EIN 6940—Supervised Teaching (1-5; max: 5) S/U.

EIN 6971—Research for Master's Thesis (1-15) S/U.

EIN 6972—Research for Engineer's Thesis (1-15) S/U.

EIN 7933—Special Problems (1-6; max: 12) Laboratory, lecture, field work, or conferences.

EIN 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.

EIN 7980—Research for Doctoral Dissertation (1-15) S/U.

ESI 5236—Reliability Engineering (3) *Prereq: ESI 4568, STA 4322.* Mathematical models and methods of reliability engineering. Typical component failure distributions; system reliability as a function of component reliability. Reliability block diagrams and fault trees.

ESI 5309—Operations Research: A Survey of Techniques and Applications I (3)

ESI 5310—Operations Research: A Survey of Techniques and Applications II (3)

ESI 6155C—Advanced Computer Programming for Manufacturing Control (3) *Prereq: CGS 3422, MAD 3400.* Principles and uses of production control digital computers. Software development for industrial hardware such as robots, milling machines, and automated warehouses. Laboratory developing and testing code on actual hardware.

ESI 6162C—Advanced Industrial Applications of Microprocessors (3) *Prereq: CGS 3422.* Concepts of microprocessors; microcomputer architecture and languages. Interfacing and computational requirements. Applications to industrial and manufacturing systems. Emphasis on laboratory experiments and "hands-on" experience.

ESI 6222—Statistical Quality Control (3) *Prereq: STA 4321, 6166.* Theory and practice for the control of manufacturing processes. Control statistics and their derivation. Mathematics of sampling plans. Bayesian decision rules. Applications.

ESI 6238—Reliability Theory (3) *Prereq: ESI 4568, STA 4322.* Reliability and stochastic models as a function of system configurations. Reliability predictions for various underlying component failure laws. Sensitivity analysis. Models of interdependent systems.

ESI 6314—Deterministic Methods in Operations Research (4) *Prereq: calculus through differential equations, knowledge of linear algebra, and experience using mainframes or PCs.* Introduction to basic models and their solution with modern computer packages. Emphasis on modeling, computer solution, and sensitivity analysis with minimal reference to model theory and development of algorithmic methods.

ESI 6321—Applied Probability Methods in Engineering (3) *Prereq: calculus, differential equations, undergraduate probability, and statistics.* Applied probability theory and statistics, reliability engineering, quality control, robust design, forecasting, Markov processes, and queueing theory.

ESI 6337—Markov Processes, Queueing Theory, and Applications (3) *Prereq: ESI 4568, STA 5325 or 6326.* Development of Markov models in discrete and continuous time. Classification of queues. Analysis of selected systems.

ESI 6358—Games and Decision Theory (3) *Prereq: ESI 6417 and probability theory.* Games in extensive and normal form. Two-person zero-sum bimatrix and multi-stage games. Coalitions and n-person games. Games against nature and Bayesian decision theory.

ESI 6417—Linear Programming and Network Optimization (3) *Prereq: matrix theory.* Formulation and solution techniques for network flow and linear programming problems. Algorithms for network optimization. The simplex method, theory and computation. Duality theory, sensitivity analysis.

ESI 6418—Linear Programming Extensions and Applications (3) *Prereq: ESI 6417, 6429.* Extension of linear programming to large scale linear and nonlinear problems. Integer programming methods. Applications of the methodology to real world models.

ESI 6429—Introduction to Nonlinear and Dynamic Programming (3) *Prereq: ESI 6417 and multivariable calculus.* Classical optimality conditions, constrained optimality conditions. Basic nonlinear programming algorithms, dynamic programming techniques.

ESI 6458—Network Flows and Graph Theory (3) *Prereq: ESI 6417.* Mathematical formulations and solution techniques for network flow and combinatorial optimization problems. Application to problems of scheduling, routing, and network design.
ESI 6470—Principles of Manufacturing Systems Engineering (3) *Prereq: calculus through differential equations.* Introduction to modern manufacturing systems. Components of product and process design, computer-integrated manufacturing and automation. Current areas of development and research.
ESI 6508—Systems Analysis I (3) *Prereq: ESI 4568, STA 4321, EEL 4657.* Review of linear systems. State variable methods for systems analysis. Techniques of modeling. Computer methods. Application to control problems.
ESI 6529—Digital Simulation Techniques (3) *Prereq: computer programming and probability theory.* Computer programming aspects of digital simulation. Deterministic simulation; stochastic simulation. Use of simulation languages.
ESI 6546—Stochastic Systems Analysis I (3) *Prereq: ESI 6337 or STA 6826.* Classification of stochastic processes. Axiomatic derivation of the Poisson process. Filtered Poisson process. Renewal processes. Branching processes. Selected applications.
ESI 6547—Stochastic Systems Analysis II (3) *Prereq: ESI 6546.* The Wiener process. Diffusion processes. The Fokker-Planck equation. Diffusion approximations. Multidimensional renewal processes. Selected applications.
ESI 6585C—Robot Programming and Applications (3) *Prereq: ESI 3154 or 4161.* Thorough coverage of high level robotic language. Robot classification. Applications of robotics in manufacturing. Laboratory projects with industrial robots.
ESI 6912—Advanced Topics in ISE (1-4; max: 8) *Prereq: consent of instructor.* Course work in specialized topics for graduate students.

INSTRUCTION AND CURRICULUM
College of Education

GRADUATE FACULTY 1993-94

Chair: M. C. Mahlios. *Graduate Coordinator:* R. Weade. *Professors:* R. A. Blume (Emeritus); E. J. Bolduc, Jr.; G. D. Carr; J. D. Casteel; R. Crews *(Emeritus);* M. Early (Emeritus); H. T. Fillmer; J. W. Gregory; C. L. Hallman; S. O. Johnson; E. L. Kantowski; J. J. Koran, Jr.; L. L. Lamme; M. C. Mahlios; V. McGuire (*Emeritus*); B. F. Nelms; L. C. Oberlin; W. R. Powell; D. D. Ross; M. B. Rowe; E. A. Todd; E. L. Williams (*Emeritus*). *Associate Professors:* D. H. Bernard; L. L. Cronin-Jones; R. C. Ferguson (*Emeritus*); C. A. Henderson (*Emeritus*); N. L. Hoover; J. A. Hurt; A. E. Morgan; L. J. Mullally; A. P. Newcomb, Jr. (Emeritus); A. B. Packer *(Emeritus);* J. J. Shea (*Emeritus*); E. C. Turner; R. Weade; R. G. Wright. *Assistant Professors:* T. L. Adams; E. Bondy; J. Comas; P. R. DeHart; L. Hartle; K. M. Kemple.

The Department offers programs leading to the Master of Education (nonthesis) and Master of Arts in Education (thesis) in curriculum and instruction (with emphasis in educational media and instructional design, middle school education, or English speakers of other languages), early childhood education, elementary education, English education, foreign language education, mathematics education, reading education, science education, and social studies education. Proteach prepares secondary teachers who have completed the bachelor's degree in the discipline they will teach and elementary teachers who have completed the Department's undergraduate elementary education program. The standard master's is designed for teachers who are already certified.

The Department also offers the Specialist in Education, Doctor of Education, and Doctor of Philosophy degrees in curriculum and instruction with specializations in the aforementioned areas plus business education, instructional computing, and physical education.

Beyond the Graduate School and College of Education admission requirements, students should have previous preparation appropriate to the program being pursued. Students having deficiencies in their previous preparation will be required to follow a program to remove such deficiencies.

In addition to the graduate courses in Instruction and Curriculum described in this section the following courses in related areas are acceptable for graduate credit as part of the student's major: EDF 6113—Educational Psychology: Human Development; EDF 6175—Educational Psychology: Adulthood; EDF 6215—Educational Psychology: Learning Theory; EDF 6436—Theory of Measurement; EDF 6487—Assessment of Classroom Behavior; EDF 6520—History of Education; EDF 6544—Philosophical Foundations of Education; EDF 6630—Sociology of Education; EDF 6712—Comparative Education; EDG 6250—The School Curriculum; EDG 7222—Curriculum Theory and Research.

Students may not enroll for more than one special topics course within the same semester.

General Courses

ECO 6075—Economics/Consumer Education (3) Objectives, content, resource materials, and methods of teaching economic/consumer education in the elementary and secondary schools.
EDG 6691—Problems in Curriculum and Instruction (2-10; max: 10) Topics not available in regularly listed courses. For credit institutes, workshops, and short credit courses.
EDG 6705—The Education of Culturally Disadvantaged Children and Youths (3) Curriculum content and procedures pertinent to educational needs.
EDG 6910—Supervised Research (1-5; max: 5) S/U.
EDG 6931—Special Topics (1-4; max: 12 including EDE 6905, ESE 6905) *Prereq: consent of department chair.*
EDG 6971—Research for Master's Thesis (1-15) S/U.
EDG 7941—Field Experience in Curriculum and Instruction (1-4; max: 10) *Admission limited to advanced graduate students.* Supervised experiences appropriate to the student's professional goals.
EDG 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.
EDG 7980—Research for Doctoral Dissertation (1-15) S/U.

Early Childhood Education

EEC 5944—Laboratory in Nursery-Kindergarten Teaching I (3) *Prereq: consent of instructor and teaching experience.*
EEC 5945—Laboratory in Nursery-Kindergarten Teaching II (3) *Prereq or coreq: EEC 5944 or consent of instructor and teaching experience.*
EEC 6205—Early Childhood Curriculum (3) Students will develop and/or implement instructional strategies consistent with their personal philosophies of early childhood education. Open to majors and nonmajors seeking introductory knowledge of the field.
EEC 6304—Creativity in the Early Childhood Curriculum (3) Techniques for teaching all areas of the early childhood curriculum so that these areas may be learned more creatively.
EEC 6525—Day Care for Young Children (3) The background curriculum, organization, staffing, training of staff, parent education and involvement, funding, and research of day care.
EEC 6615—Early Childhood Education: Background and Concepts (3) Trends in the teaching of nursery and kindergarten children as shown in past and current educational theory.
EEC 6946—Practicum in Early Childhood Education (1-6; max:

11) Supervised experience in a variety of early childhood settings with weekly seminars.
EEC 6947—Practicum in Parent Education (1-6; max: 11) Supervised experience in a variety of parent education program settings with weekly seminars.
EEC 7932—Seminar in Early Childhood Education (1-6; max: 6) *Open to advanced graduate students.*

Educational Media and Instructional Design

EME 5403—Instructional Computing I (3) *Prereq: COP 3210.* Use of computers in elementary, middle, and secondary schools. Development of software for school settings. Review of commercial courseware. Study of BASIC will be extended through use of random and sequential files.
EME 5404—Instructional Computing II (3) *Prereq: EDG 5403.* Use and development of computer assisted instruction in school settings. A study of computer authoring languages with major emphasis on the PILOT language.
EME 6115—Selection of Print and Nonprint Materials (3) *Prereq: consent of instructor.* Selection and acquisition of print and nonprint materials for library/media center collections. Guidelines, selection tools, standards, and procedures.
EME 6205—Photographic and Graphic Production Techniques (4) *Prereq: EME 4201.* Skills in the techniques of photographic processes, including black and white photography and audio/slide presentations. Principles of planning, designing, and applying graphics to the production of instructional material.
EME 6335—Cataloging and Classification of Print and Nonprint Materials (3) Concepts and methods of organizing a multi-media collection. Emphasis on an examination of cataloging and classification procedures for public school media centers.
EME 6337—References and Bibliographic Sources and Services (3) *Prereq: consent of instructor.* Examination of library/media center reference sources. Selection of reference sources, accessing information through reference materials, and compiling and utilizing bibliographies.
EME 6405—Computer Applications in Education (4) Students will develop a knowledge of computer technology in education and apply that knowledge to the solution of educational problems. Experience in working with computer systems will be provided.
EME 6505—Educational Television Design and Production (4) Students will learn to plan, produce, use, and evaluate video-tape programs for educational purposes. They will learn to operate the major components of a small, nonbroadcast television studio.
EME 6606—Instructional Development (4) *Prereq: EME 4102.* Understanding systems concepts, analyzing the instructional development process, and applying the process to a specific instructional problem in order to improve the instruction.
EME 6716—Organization and Administration of Educational Media Centers (3) Principles of organizational and administrative theory and procedures and issues related to the selection of instructional materials applied to the operation of EMCs at all levels of education.
EME 6945—Practicum in Educational Media and Instructional Design (3-8; max: 8) Supervised experiences appropriate to the student's professional goals.
EME 7938—Seminar in Educational Media and Instructional Design (3; max: 9) Seminar for advanced degree graduate students.

Elementary Education

EDE 6205—Elementary School Curriculum (3) *Primarily for students with no course background or teaching experience in elementary curriculum.*
EDE 6225—Practices in Childhood Education (3) *Prereq: course background or teaching experience in the elementary curriculum.* Elementary school practices in relation to fundamental principles of curriculum development; selection, organization, and development of effective teaching-learning situations.
EDE 6905—Individual Work (1-5; max: 12 including ESE 6905) For advanced students who wish to study individual problems in childhood education and/or early childhood education under faculty guidance.
EDE 6910—Supervised Research (1-5; max: 5) S/U.
EDE 6932—Special Topics (1-5; max: 10) *Prereq: permission of department chair.*
EDG 6427—Parent Education for Educators (3) Review of roles of parents and children in the family; planning and conducting parent education units for children and parents.
EDE 6948—Internship in Elementary Schools (1-12; max: 12) *Prereq: consent of the instructor.* Supervised teaching in elementary grades 1-6. S/U.
EDE 7247—Problems in Childhood Education I (3) Advanced course in elementary school curriculum.
EDE 7248—Problems in Childhood Education II (3)
EDE 7935—Seminar in Elementary Education (1-6; max: 6) *Prereq: EDE 6948. Open to advanced graduate students.* Current research and an overview of the total program.

English Education

LAE 6237—Teaching Adolescent Literature in the Secondary School (3) Explorations into what adolescent literature is and into the theory and practice of teaching it in grades 7-12.
LAE 6265—Teaching Composition Skills (3) Selected theories and practices in the teaching of composition skills in grades 7-14.
LAE 6301—Emergent Literacy (3) *Prereq: RED 4147.* Factors influencing early language and their relationship to beginning school programs in listening, speaking, reading, and writing.
LAE 6319—Language Arts in the Elementary School (3) Speaking, listening, writing, and language study in the elementary classroom.
LAE 6339—Teaching English in Secondary School (3) *Prereq: 30 hours of upper-division English. Designed for Proteach students only.* Introduction to the theory and practice of teaching English.
LAE 6365—Language Arts: Language and Composition (3) Methods and materials for teaching language and composition in the secondary school. This course and LAE 6366, in conjunction, comprise methods and materials for teaching English in the secondary school.
LAE 6366—Language Arts: Literature (3) Methods and materials for teaching literature in the secondary school. This course and LAE 6365, in conjunction, comprise methods and materials for teaching English in the secondary schools.
LAE 6407—Early Childhood Children's Literature (3) *Prereq: a course in children's literature.* Methods of involving young children (birth through kindergarten) with literature and the role of literature in the home and school.
LAE 6714—Children's Literature in the Childhood Curriculum (3) Evaluating, selecting, and using fiction, biography, poetry, and informational books for instructional, informational, and recreational purposes.
LAE 6945—Practicum in Teaching Secondary School English (3) *Prereq: consent of department chair.* Directed experiences emphasizing instructional strategies, selecting instructional materials, sequencing student activities, utilizing instructional moves, and diagnosing student progress. Field and laboratory settings.
LAE 7936—Seminar in English Language Arts (3; max: 6) *Prereq: consent of instructor.* Contemporary developments and research in language arts education.

Foreign Language Education

FLE 6165—Bilingual-Bicultural Education (3) Principles and practices in the field of bilingual-bicultural education in the U.S. and in other nations. Examination of theories and practices related to issues, analysis of problems, curricular strategies.
FLE 6167—Cross-Cultural Communication for Teachers (3) Pedagogical strategies, curricular materials, and management systems for multicultural classrooms, K-12.
FLE 6336—Teaching Foreign Languages in Elementary Schools (3) Theory and methods, historical influences, curriculum design, thought content, first and second language acquisition, applications, integration of culture in the foreign language classroom.
FLE 6337—Foreign Languages in the Secondary School (3) Patterns of foreign language curricula; practices in teaching foreign languages; preparation, selection, and use of instructional materials; laboratory experience and classroom teaching.

FLE 6946—Practicum in Teaching Secondary School Foreign Languages (3) *Prereq: consent of department chair.* Directed experiences emphasizing instructional strategies, selecting instructional materials, sequencing student activities, utilizing instructional moves, and diagnosing student progress. Field and laboratory settings.
FLE 7148—Problems and Readings in Bilingual-Bicultural Education (2; max: 8) Research and literature dealing with issues, curricular planning and evaluation, and with experimentation focused on roles and problems of instructional leaders and teacher trainers.

Mathematics Education

EDG 6375—Teaching Early Childhood Mathematics and Science (3) The process approach to teaching mathematics and science to children in preschool through primary program with a focus on inquiry and discovery methods and formal curriculum programs.
MAE 5318—Teaching Modern Math in Elementary School (3)
MAE 6138—Mathematics in the Secondary School (3) *Prereq: preparation in subject area equivalent to requirements for high school certification and an appropriate methods course.* Patterns of mathematics curriculum; practices in teaching mathematics; preparation, selection, and use of instructional materials; laboratory experience and classroom teaching.
MAE 6345—Teacher Verbal Behavior in the Mathematics Classroom (3) Systematic analysis of teacher-pupil verbal interaction in mathematics lessons. Acquisition of technical presentation skills through microteaching. For teachers of mathematics at any level.
MAE 6512—Laboratory in Diagnosing Mathematics Skills (3-6; max: 6) Diagnosis, correction, and prevention of mathematical learning difficulties; work with children in the applications of principles under study.
MAE 6615—Individualizing Instruction in Mathematics (3) Organizing a continuous progress program: objectives, diagnostic testing, placement of students, record keeping, evaluation, and reporting. Role of the teacher and team teaching as well as development of a bank of materials, games, and activities for an individualized mathematics program.
MAE 6636C—Laboratory Approach to Mathematics (1-4; max: 4) Rationale for use of investigatory experiences with objects in the mathematics curriculum. Involvement in planning laboratory facilities and activities for classroom use. Analysis of the problems of teaching mathematics to low achievers.
MAE 6947—Practicum in Teaching Secondary School Mathematics (3) *Prereq: consent of department chair.* Directed experiences emphasizing instructional strategies, selecting instructional materials, sequencing student activities, utilizing instructional moves, and diagnosing student progress. Field and laboratory settings.
MAE 7899—Mathematics Education Seminar (3) *Prereq: MAE 6138.* Issues and problems in mathematics education, and investigation and planning of research relevant to selected problems.

Middle School Education

EDM 6005—The Emergent Middle School (3) Program, organization, and rationale of the newly emerging middle school in American school districts.
EDM 6945—Methods and Practicum in Middle Level Education (1-9; max: 9) Field experience and methods instruction in middle level education. This course does not substitute for student teaching. S/U.

Reading Education

RED 5316—Reading in the Primary Grades (3) Emphasis on materials and methods for use with young children at prereading and beginning reading levels.
RED 5337—Reading in the Secondary School (3) Patterns of reading instruction in the secondary school; methods of teaching reading for teachers of all subject areas; preparations, selection, and use of instructional materials; selected field or micro-teaching experiences.
RED 5355—Reading in the Intermediate Grades (3) Emphasis on materials and methods for teaching reading to students in upper elementary grades, middle, and junior high schools.
RED 6040—Management of Reading Instruction (1) Self-instruction designed to help professionals make informed decisions regarding the administration, implementation, and support of reading programs at all levels of education.
RED 6247—Organization and Supervision of School Reading Programs (3) Procedures for planning, improving, and evaluating reading programs on a systemwide basis.
RED 6346—Classroom Reading II (3) *Prereq: consent of instructor.* A critical examination of the teaching of reading in today's classrooms in light of relevant research.
RED 6546C—Diagnosis of Reading Disabilities (3) *Prereq: RED 4313.*
RED 6548C—Remediation of Reading Disabilities (3) *Prereq: RED 6546.* Advanced procedures and practices for remediating reading disabilities in classroom and clinic.
RED 6646—Problems in Reading (3) *Prereq or coreq: RED 6548.* Specific reading problems, such as those encountered in the classroom situation, studied by individuals or small groups; the teaching of reading on any grade level.
RED 6656—Trends in the Teaching of Reading (3) *Prereq: basic course in teaching reading.* Trends analyzed by study of research; consideration of controversial issues involving classroom organization, methods, and materials.
RED 6667—Issues in High School and Adult Reading (3) Exploration of significant problems, points of view, and trends in high school and adult reading, with an emphasis on research.
RED 7747—Analysis of Theory and Research in Reading (3; max: 9) Detailed and critical study of outstanding theories and research contributions to the field of reading with implications for education.
RED 7818—Clinical Diagnosis in Reading (4) *Prereq: RED 6548.* Examination of diagnostic systems in reading and practical application of those systems with learners experiencing reading difficulties.
RED 7819—Practicum in Clinical Diagnosis in Reading (4) *Prereq: RED 7818.* Supervised experience in diagnosis and remedial techniques of severe reading disabilities.
RED 7938—Seminar in Reading (2; max: 16) *Prereq: advanced graduate standing.* Contemporary issues and research in reading.
RED 7947—Internship in Reading (6) *Prereq: graduate standing and prior arrangements made with coordinating professor in reading program area.* Provides for field experiences in the area of reading; students are placed in an approved and supervised field position for practical experience.

Science Education

SCE 6117—Science Education in the Elementary School (3) Current problems, new materials and teaching techniques, research and recent developments in the sciences.
SCE 6290—Science Instruction in Informal Settings (3) Review of Theory and practice research regarding instructional techniques and curricula most appropriate for K-12 science instruction in informal settings such as museums, nature centers, zoos, and outdoor school yards.
SCE 6338—Science Methods and Materials in the Secondary School (3) *Prereq: acceptance into secondary PROTEACH program; coreq: SCE 6947.* Introduction into theory and practice of teaching secondary school science, emphasis on planning, instruction, and assessment.
SCE 6736—Evaluating Science Curricula in the Secondary School (3) Applications of curriculum evaluation theory and systems to contemporary science curricula.
SCE 6947—Practicum in Teaching Secondary School Science (3) *Prereq: consent of department chair.* Directed experiences emphasizing instructional strategies, selecting instructional materials, sequencing student activities, utilizing instructional moves, and diagnosing student progress. Field and laboratory settings.
SCE 7238—Learning and Instruction in Secondary School Science (3) Selected topics in the acquisition of knowledge in science and the arrangement of conditions for science learning in the secondary schools.

SCE 7933—Science Education Seminar (3) *Prereq: SCE 6117.* Issues and problems in science education and the investigation and planning of research relevant to selected problems.

Secondary Education

ESE 6215—The Secondary School Curriculum (3) Scope, function, and types of secondary school curricula and ways of improving existing programs.
ESE 6345—Effective Teaching in Secondary School (3) *Prereq: consent of department.* Advanced strategies for planning and presentation of the general academic content of mathematics, science, foreign language, social studies, and English in the secondary school.
ESE 6385—Supervision of Pre-Service Teachers (1-3; max: 3) Functions of the directing teacher in the program including problems and procedures of supervising the work of pre-service teachers.
ESE 6905—Individual Work (1-4; max: 12 including EDE 6905)
ESE 6939—Special Topics (1-4; max: 10)
ESE 6945—Student Teaching in Secondary School (3-6; max: 12) *Prereq: consent of instructor.* Supervised teaching in the secondary school, grades 7-12.

Social Studies Education

SSE 5945C—Practicum in Teaching Secondary Social Studies (3) *Prereq: consent of department chair.* Directed experiences emphasizing instructional strategies, selecting instructional materials, and diagnosing student progress. Field and laboratory settings.
SSE 6046—Perspectives in Social Studies Education (3) Seminar in the analysis of works written by important social studies educators.
SSE 6117—Social Studies Education—Elementary School (3) *Prereq: graduate curriculum course.* Contributions of social education to the total elementary school program, with emphasis on social interaction and programs and procedures in social studies area.
SSE 6133—Social Studies in the Secondary School (3) Patterns of social studies' curricula; practices in teaching social studies; preparation, selection, and use of instructional materials; laboratory experience and classroom teaching.

LANDSCAPE ARCHITECTURE
College of Architecture

GRADUATE FACULTY 1993-94

Chairman: H. H. Smith. *Graduate Coordinator:* D. W. Donelin. *Professors:* D. W. Donelin; H. H. Smith. *Associate Professors:* R. R. Grist; L. L. Linscott; S. K. Williams. *Assistant Professors:* M. H. Carr; M. C. Gurucharri; R. V. Murray.

The Department of Landscape Architecture offers graduate work leading to the Master of Landscape Architecture, an advanced professional degree program, accredited by the Landscape Architectural Accreditation Board. Emphasis areas include landscape architectural theory and design, communications, landscape management, ethics and aesthetics, environmental quality, and ecological, cultural, and behavioral assessment. Course work and/or interdisciplinary studies are available in the graduate programs in urban and regional planning, architecture, and building construction as well as in graduate programs in other colleges. Course work in landscape architecture is aimed toward research in the discipline and provides opportunities for study in one or more areas advancing the knowledge or capability of the professional. It is the intent of the Department of Landscape Architecture to achieve accreditation. Students are admitted for advanced studies as follows:

1. Related or Nonrelated Degree Base.—All persons holding baccalaureate degrees in any academic area may apply. A portfolio of studio work examples is required of students from related degree backgrounds. Students are admitted for summer semester and must complete up to 45 semester hours of articulation courses to meet basic knowledge and skill requirements. Articulation courses do not count toward the graduate degree and must be completed prior to beginning the 52-hour program. Students matriculating in this track will be in a first professional program at the master's level.

Students admitted to this track should have adequate undergraduate training in biological, physical, and behavioral sciences. Articulation and graduate work is normally completed in two and one-half to four years.

2. Bachelor of Landscape Architecture Degree Base.—All persons from any state, territory, or foreign country holding this degree or its equivalent as determined by accreditation standards may apply. Twelve hours of the 52-hour requirement designated as core courses may be taken at either the University of Florida or the Florida International University campus.

3. Advanced Professional Life Experience (APLE) Base.—It is recognized that substantial practice in an agency or office can be documented and examined. Landscape architects who are licensed or certified to practice in any state, territory, or foreign country and who meet graduate admissions requirements may apply. Where licensure or certification is not a condition for employment, landscape architects who meet all other requirements should also consider this track. All APLE documentation is retained by the Department. Students must take LAA 6215 during their first semester of registration. A minimum of 30 semester hours including 6 hours of thesis is required.

In addition, all students in who have earned graduate credit in related fields in the University of Florida may transfer six to eight semester hours (two courses) toward the degree requirement. Such a transfer of credit requires the approval of the Department and the Dean of the Graduate School.

Students with BLA or APLE base are encouraged to enter the program in fall semester and normally complete the work in one to two academic years. Applications for admission and APLE documentation must be received 90 days prior to the beginning of the desired semester.

In addition to course work, students who cannot document a landscape architecture work experience are required to complete a supervised internship in a public agency or private sector office. All students must complete a thesis or project.

LAA 6215—Advanced Landscape Architecture Practice (3) Profile development of office practice in the United States. Examination of landscape architectural work related to Florida statutes and responsible practice. Required for APLE documentation.

LAA 6222—Information Flow and Exchange (3) Case studies and project work in natural and built environments with emphasis on user behavior and communication of environmental values. Designated as core course.
LAA 6322—Project Management for Landscape Architects (3) Survey of analytical models with emphasis on marketing services, cost data, estimation, project developments, and project management for landscape architectural work. Designated as core course.
LAA 6342—Landscape Architecture and Environmental Quality (3) Case studies and readings in aesthetic criticism. Development of evaluation models with emphasis on user perception. Designated as core course.
LAA 6382—Ecological and Environmental Policy (3) Survey of major environmental policy and law with particular reference to Florida case studies. Designated as core course.
LAA 6525L—Advanced Landscape Construction Design (6) Development of simulation techniques for production drawings and project management of selected comprehensive works of landscape architects.
LAA 6656C—Advanced Landscape Architectural Design (1-12; max: 12) Complex project design with emphasis on restructuring and rebuilding urban places and disturbed landscapes. H.
LAA 6835L—Interdisciplinary Studio (1-6; max: 6) Interactive course in architecture, urban and regional planning, building construction, and other disciplines. Design team concepts and problem solving. H.
LAA 6905—Directed Study (1-3; max: 9)
LAA 6910—Supervised Research (1-5; max: 5) S/U.
LAA 6931C—Special Topics (1-3; max: 6) Development of a current design opportunity. May be in collaboration with a professional office.
LAA 6940—Supervised Teaching (1-5; max: 5) S/U.
LAA 6941—Supervised Internship (3) Required of all students who do not document a landscape architectural experience. S/U.
LAA 6971—Research for Master's Thesis (1-15) S/U.
LAA 6979—Terminal Project (1-6) This option, in lieu of thesis, is available for a design project which because of magnitude or design complexity does not adapt to thesis format. S/U.

CENTER FOR LATIN AMERICAN STUDIES
College of Liberal Arts and Sciences

GRADUATE FACULTY 1993-94

Director & Graduate Coordinator: T. L. McCoy. *Associate Director:* D. Pacini. *Graduate Research Professors:* M. Harris; M. J. MacLeod; A. Prieto. *Eminent Scholar:* J. F. Eisenberg. *Distinguished Service Professor:* C. G. Davis; D. A. Denslow; P. L. Doughty. *Professors:* J. Alvarez; C. O. Andrew; G. A. Antonini; A. O. Avellaneda; H. R. Bernard; A. F. Burns; J. D. Casteel; C. N. Caviedes; K. A. Deagan; J. K. Dow; T. C. Emmel; J. J. Ewel; K. C. Ewel; D. P. Geggus; C. H. Gladwin; M. W. Gordon; C. L. Hallman; M. J. Hardman-de-Bautista; P. E. Hildebrand; S. R. Humphrey; J. R. Johnson; K. E. Kent; C. F. Kiker; J. J. Koran, Jr.; M. R. Langham; M. L. Margolis, T. L. McCoy; J. T. Milanich; M. E. Moseley; W. D. Mulkey; A. R. Oliver-Smith; D. A. Pharies; R. N. Pierce (*Emeritus*); H. L. Popenoe; R. R. Renner; H. I. Safa; S. E. Sanderson; M. C. Schmink; J. R. Simpson; N. J. Smith; G. A. D. Soares; A. Spring; P. J. van Blokland; E. S. Wing; C. A. Woods. *Associate Professors:* E. C. French; A. Hansen; R. L. Jimenez; L. S. Lieberman; S. Milbrath; G. F. Murray; J. D. Needell; C. A. Perrone; K. H. Redford; J. F. Scott; J. L. Seale; Y. Toda; H. Vera. *Associate Scholar:* F. M. Trueblood. *Associate Scientist:* M. E. Sunquist. *Assistant Professors:* D. Pacini; P. J. Williams. *Assistant Scientist:* S. K. Jacobson.

The Center for Latin American Studies offers the following programs in graduate studies: (1) an interdisciplinary Master of Arts degree, (2) Certificates and minors in Latin American studies in conjunction with disciplinary degrees in the Colleges of Agriculture, Architecture, Business Administration, Education, Fine Arts, Journalism and Communications, Law, and Liberal Arts and Sciences.

The graduate program in Latin American studies consists of over 200 courses with Latin American content taught in more than 30 departments of the above colleges.

A description of the several degree and certificate programs in Latin American studies may be found in the section *Special Programs*. Listings of courses other than those enumerated below may be found in individual departmental descriptions and the *Bulletin* of the Center for Latin American Studies. Copies of the *Bulletin* may be obtained from the Director, 319 Grinter Hall.

LAS 6905—Individual Work (1-3; max: 9) Reading or research in topics focusing on a Latin American area, but cutting across disciplines.
LAS 6938—Latin American Area Seminar (3; max: 9) *Prereq: Latin American area concentration.*
LAS 6971—Research for Master's Thesis (1-15) S/U.

LINGUISTICS
College of Liberal Arts and Sciences

GRADUATE FACULTY 1993-94

Director: J. Casagrande. *Graduate Coordinator:* W. J. Sullivan. *Professors:* W. S. Brown, Jr.; A. F. Burns; J. Casagrande; C. C. Chu; R. deBeaugrande; H. Der-Houssikian; M. J. Hardman-de-Bautista; H. Hollien; P. J. Jensen; N. N. Markel; K. M. McCarthy; D. A. Pharies; R. J. Scholes. *Associate Professors:* P. A. Kotey; D. G. Miller; W. J. Sullivan III; R. M. Thompson. *Assistant Professors:* D. Boxer; M. Mohammad; A. Tyler; A. Wehmeyer; A. Wyatt-Brown.

Linguistics offers graduate programs leading to the M.A. and Ph.D. degrees with specializations in (a) the core areas of the discipline (theoretical and descriptive phonetics, phonology, syntax, linguistic change) and (b) applied linguistics (sociolinguistics, first and second language acquisition, psycholinguistics, neurolinguistics). Also offered to degree-seeking students in applied linguistics and related disciplines is a Certificate in Teaching English as a Second Language.

Applicants who have deficiencies in linguistics must fulfill prerequisites prior to graduate work in the field. These deficiencies can be met by taking LIN 3010, 3200, and 3460 or the equivalent. For detailed information on the programs, including financial aid, please contact Linguistics by calling (904) 392-0639 or by mail addressed to Linguistics, 112 Anderson Hall, University of Florida, Gainesville, FL 32611.

As part of its service to the University community, Linguistics also offers programs for international applicants and admitted students. These programs are The English Language Institute (ELI), the Scholarly Writing Program (SW), and the Academic Spoken English Program (ASE). Applicants whose command of English is not as good as expected may be required by their department to attend the ELI, an intensive English program designed to provide rapid gain in English proficiency. An ELI student may require one, two or, exceptionally, three semesters of full-time English studies before entering Graduate School. Information about the ELI is available in 315 Norman Hall.

The Scholarly Writing Program is designed to help international graduate students improve their writing ability. Applicants whose verbal GRE scores are below 320 or who have been admitted provisionally with a TOEFL score lower than 550 are given a writing test. Those demonstrating a lower proficiency than needed for successful performance in written tasks at the graduate level are required to take ENS 4449. Another course, ENS 4450—Research Writing, is offered for those who wish to learn to write in their field of study. Information about the SW Program is available at the Coordinator's office, 310 Norman Hall.

The ASE Program is designed to help those who expect to be Graduate Teaching Assistants at the University of Florida but who cannot demonstrate a high enough proficiency in English. The required course at the lowest level is ENS 5501. Another course, ENS 5502, is offered to students whose proficiency is good enough to begin teaching but who still need help learning to use English in an American classroom. Teachers are videotaped and their class work discussed constructively by the ASE staff. The third course, ENS 5503, is a tutorial. Candidates for teaching appointments tutor American students in their specialty. Videotapes of these encounters are used by the ASE staff just as in 5502. For additional information about the ASE, please contact the ASE Office in 1349 Norman Hall or call 392-3286.

Linguistics Core

LIN 5203—Forensic Phonetics (3) Analysis of stored, speed, surveilance, recording/decoding of speed, authentication of tape recordings, speaker identification, stress identification, stress analysis, and quantitative analysis of language.
LIN 6018—Leading Ideas in Linguistic Theory (3) *Prereq: LIN 3010.* Leading ideas, reasoning, and structures.
LIN 6084—Introduction to Graduate Research (3) Scholarly and scientific approaches to study of linguistics. Scientific method, theory development, data processing, scholarly writing, and structure of research proposals.
LIN 6128—Historical Linguistics (3) *Prereq: LIN 6323, 6501.* Principles and methods of historical and comparative linguistics, development of competing models for language change and linguistic relatedness. Examples and problems from a broad spectrum of the world's languages.
LIN 6129—Issues in Historical Linguistics (3) *Prereq: LIN 6341, 6520, 6128.* Advanced diachronic linguistics. The mutual interdependence of diachronic and synchronic analyses of language.
LIN 6205—Phonetics for Linguists (3) Understanding of issues in experimental phonetics and appreciation of research techniques in acoustical, physiological, and perceptual study in speech.
LIN 6323—Phonology (3) *Prereq: LIN 3200.* Phonemics, syllabic and prosodic phenomena, neutralization, distinctive features, morphophonemic alternation, phonological systems and processes. Terminology and notational conventions of generative phonology. Problems from a variety of languages.
LIN 6341—Issues in Phonology (3) *Prereq: LIN 6323.* Technical articles from a variety of twentieth-century schools, including American and European structuralism, generative and stratificational phonology, natural and metrical-syllabic phonology.
LIN 6402—Morphology (3) *Prereq: LIN 3460; coreq: LIN 6018.* Theory of word structure, derivation and inflection. The position of morphology in a grammar, the relationship between morphology and the rest of the grammar, typology, cultural and conceptual categories, predictions of various theories of morphology. Examples and problems from a wide variety of the world's languages.
LIN 6410—Issues in Morpology (3) *Prereq: LIN 6402.* Technical articles from variety of twentieth-century schools. Prominent inquiries include place of morphology in grammar, its relationship with other components, and whether a unified theory of morphology can be constructed.
LIN 6501—Syntax (3) *Prereq: LIN 3460.* Structures of sentences, clauses, and phrases (heads, complements, specifiers, and modifiers); grammatical relations; sememic roles; case, concord, and government; anaphora; universals; typology. Issues include autonomy, modularity, X-bar theory, the nature of syntactic rules, underlying and surface structures. Problem-solving. Exercises from a wide variety of languages.
LIN 6520—Issues in Syntax (3) *Prereq: LIN 6501.* Technical articles by syntacticians from a variety of twentieth-century schools, including generative semantics, relational grammar, lexical-functional grammar, various process and discourse models, EST, and X-bar theory.
LIN 6562—Discourse Grammar (3) *Prereq: LIN 3010 and/or 6501.* Recent developments in study or relationships between sentence grammar and discourse. Subject and theme, relativization and subordination, pronoun and anaphora, transitivity, tense and aspect, information structure, and discourse basis for grammatical categories. Synthesis of topics into systematic framework.
LIN 6571—Structure of a Specific Language (3) *Prereq: introductory linguistics course.* Linguistic examination of one of the following Aymara, Cakchiquel, Eskimo, Armenian, Ga, Bulgarian, Polish, Turkish, Twi, Quechua.
LIN 6905—Individual Study (1-3; max: 12)
LIN 6910—Supervised Research (1-5; max: 5) S/U.
LIN 6932—Special Topics (3; max: 27)
LIN 6940—Supervised Teaching (1-5; max: 5) S/U.
LIN 6971—Research for Master's Thesis (1-15) S/U.
LIN 7118—History of Linguistics (3) *Prereq: LIN 6323, 6501.* The history of accounting for language data as evidenced by grammar-writing from Panini to the twentieth century, with primary focus on the development of linguistic thought in Europe and America.
LIN 7149—Seminar in Language Change (3; max: 9) Possible topics include problems in diachronic syntax; comparative reconstruction; comparative/historical treatment of a language or family (Semitic, Indo-European, Bantu, etc.).
LIN 7342—Seminar in Phonology (3; max: 9) Possible topics: the syllable, advanced topics in autosegmental and metrical phonology, plus selections of the latest work in phonological thinking.
LIN 7580—Seminar in Syntax/Semantics (3; max: 9) Possible topics: discourse analysis, pragmatics, cultural and universal concepts, advanced topics in government and binding theory, logic and linguistics, and the lexicon in linguistic theory.
LIN 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.
LIN 7980—Research for Doctoral Dissertation (1-15) S/U.

Applied Linguistics

ENC 6720—Introduction to Writing Theory and Research (3) Theoretical background to writing theory, research, and pedagogy.
ENG 6571—American Social Dialects (3) *Prereq: introductory linguistics course.* Language variations, especially in relation to the ethnic and racial boundaries of American society.
LIN 5657—Gender and Language (3) *Prereq: introduction to linguistics.* Language in the construction of cultural, sex, and gender roles within a culture. A focal point is the grammaticalization of gender in languages of the world including non-Indo-

European languages, and of the interactions of these grammatical structure with gender stereotypes. Consequences for linguistic science of grammatical structures.

LIN 5741—English Structure for TESL (3) English phonology, morphology, syntax, and semantics, including historical analysis of irregularities in English and descriptions of dialect features.

LIN 6339—Seminar: Applied Phonology (3) *Prereq: SPA 5202.* Study of the application of phonological theory in speech-language pathology, audiology, and speech science.

LIN 6601—Sociolinguistics (3) *Prereq: LIN 6323, 6501.* Major approaches to language in context: ethnographic, sociological, linguistic. Applications of sociolinguistics to applied linguistics, social sciences, and education. Collection and analysis of data.

LIN 6622—Bilingualism (3) Psycholinguistic and sociolinguistic aspects of bilingualism, with implications for education.

LIN 6642—Psychological Linguistics (3) The scientific study of language as expressive behavior. Detailed examination of experimental research on the linguistic and paralinguistic correlates of personality.

LIN 6713—Child Grammar (3) Form and function of emerging grammars in relation to cognitive/linguistic processing strategies of the child. Collection, grammatical analysis, and interpretation of child language data.

LIN 6720—Second Language Acquisition (3) The neurolinguistic, psycholinguistic, and sociolinguistic bases of second language acquisition in childhood and adulthood.

LIN 6748—Contrastive and Error Analysis (3) English phonology, syntax, semantics, and orthography compared to those of other languages, with implications for second language acquisition.

LIN 7641—Seminar in Language Variation (3; max: 9) Possible topics include variation theory, conversational interaction, language contact, bilingualism, pidgins and Creoles.

LIN 7709—Seminar in Neurolinguistics (3) Selected problems in linguistic theory and research, with emphasis on experimental analysis.

TSL 6371—Materials and Techniques for TESL I (3) Theories of TESL teaching methods and materials. Instruction in classroom materials. Observation of ESL classroom procedures.

TSL 6372—Materials and Techniques for TESL II (3) *Prereq: TSL 6371.* Continuation of TSL 6371. Instruction in designing courses and programs in ESL. Each student will be required to develop a sample ESL course.

Service Courses for International Students

ENS 4449—Scholarly Writing (3) No credit toward any graduate degree. Review and intensive practice of principles of composition for academic purposes with emphasis on the needs of each student's discipline. S/U.

ENS 4450—Research Writing (3) *No credit toward any graduate degree.* Class work and tutorials designed to help international students through writing practice to produce acceptable research papers, comprehensive examinations, and dissertations. S/U.

ENS 5501—Academic Spoken English I (4) *Required for international graduate students who expect to become teaching assistants. No credit toward any graduate degree.* Intensive training in English, particularly English used in formal speaking and pedagogy. S/U.

ENS 5502—Academic Spoken English II (3-4) *Prereq: ENS 5501 or 220 on SPEAK. Required for international graduate students who score between 220 and 250 on the SPEAK test and are teaching or will be teaching. No credit toward any graduate degree.* TAs are observed on a biweekly hasis. Weekly instruction addresses language, cultural, and pedagogical problems encountered in the classroom. S/U.

ENS 5503—Academic Spoken English Tutorial (3) *Prereq: ENS 5501 or 220 on SPEAK. Designed for international graduate students. No credit toward any graduate degree.* Focus on the language and interpersonal communication skills needed for one-on-one exchanges. International students matched with undergraduates seeking tutoring in graduate student's area of expertise. Tutoring sessions videotaped and analyzed. S/U.

MANAGEMENT
College of Business Administration

GRADUATE FACULTY 1993-94

Chairman: J. B. Ray. *Graduate Coordinator:* S. Motowidlo. *W. A. McGriff Professor:* H. L. Tosi, Jr. *Professors:* J. M. Champion; V. G. Maurer; J. B. Ray. *Associate Professors:* J. H. James; S. Motowidlo; J. W. Young. *Assistant Professor:* R. Emerson.

The Management Department offers graduate work leading to the Ph.D. in business administration, as well as a concentration in the Master of Business Administration (MBA) program. Applicants must meet the requirements for admission of the Graduate School and the College of Business Administration.

The primary orientation of the Ph.D. program is in the area of organization studies with areas of concentration in organizational behavior, organizational theory, strategy and business policy, and human resource management. The Ph.D. curriculum consists of course work in four areas: breadth, research foundations, the major field, and electives.

The breadth requirement applies only to students entering without prior course work in business. Students who do not meet the breadth requirements by virtue of their undergraduate or graduate programs before beginning the Ph.D. must take at least three graduate courses in functional areas in the College of Business Administration, outside the Department of Management. These courses should be selected to complement the students major area of study. These courses must be approved by the student's supervisory committee.

The research foundation courses include MAN 7108—Concepts and Methods in the Behavioral Sciences; six hours in statistics selected from STA 6126 and 6127, STA 6166 and 6167, or EDF 6403. Students must also select three courses from the following: MAR 7622—Design of Marketing Research, MAR 7625—Advanced Statistical Analysis in Marketing Research, MAR 7627—Subjective Measurement in Marketing and Survey Research, MAR 7628—Multidimensional Scaling for Marketing and Societal Analysis, or STA 6706—Applied Multivariate Methods for Behavioral Research. In some cases, students may substitute more advanced courses in other areas.

The major field course work is made up of a set of three required seminars, plus other work specified by the student's supervisory committee, to be completed during the student's first two years in the program. In addition, the student is required to attend MAN 7925—Workshop in Management, which features presentations by both University of Florida faculty and students and researchers from other institutions. Electives are selected from both advanced management seminars and other related disciplines to complement the student's research program. There is no formal minor requirement.

BUL 5831—Commercial Law (3) *BUL 4310. Primarily for students in MAcc program.* Contracts for sale of goods and services, documents of title, secured transactions, negotiable instruments, commercial paper, payment systems, bankruptcy, and related subject areas. Emphasis on Uniform Commercial Code, federal bankruptcy act, and other federal and uniform state laws.

BUL 5851—International Business Law (3) *Designed for MBA candidates.* Legal aspects of managing the international business environment.

BUL 6905—Individual Work (1-5; max: 10) *Prereq: BUL 4310 and consent of instructor.* Reading and/or research in business law.

BUL 6930—Special Topics (3; max: 6) *Prereq: BUL 4310 or consent of instructor.* Topics not offered in other courses and of special current significance.

BUL 6957—International Studies in Business Law (1-4; max: 12) *Prereq: admission to approved study abroad program and permission of department.* S/U.

MAN 6051—Managerial Planning (4) Managerial functions of planning. Requirements and complexities of corporate planning activity. Development of the theoretical basis of the planning process.

MAN 6107—Motivation in Organizational Setting (4) *Prereq: MAN 6245 or consent of instructor.* Theory and research on motivational processes relevant to, and applied to, individual human behavior in complex organizations.

MAN 6245—Organizational Behavior I (3) *Designed for MBA candidates.* Relationship between the individual administrator and supervisors, the employees supervised, and associates at a comparable level in the organization.

MAN 62B5—Theory and Skills of Organization Development (4) *Prereq: MAN 6245 or consent of instructor.* Dual focus on (1) theory and research on the planning of change in complex organizations and (2) laboratory practice in building intervention used by change agents.

MAN 6321—Personnel Techniques and Administration (4) *Prereq: MAN 4310.* Case studies which illustrate organizational human relations and administrative problems of the personnel administrator.

MAN 6421—Problems in Collective Bargaining (4) History, present status, and trends of collective bargaining, with an analysis of its economic, social, and legal aspects.

MAN 6721—Business Policy (3) *Designed for MBA candidates and taken last semester before graduation. Prereq: all MBA required courses.* Integrating and applying the various functional and support areas of business administration; business policy making and administration from the perspective of general manager.

MAN 6905—Individual Work in Management (1-5; max: 10) *Prereq: consent of department.* Reading and/or research in management.

MAN 6910—Supervised Research (1-5; max: 5) S/U.

MAN 6930—Special Topics (3; max: 6) *Prereq: consent of instructor/department.* Topics not offered in other courses and of special current significance.

MAN 6940—Supervised Teaching (1-5; max: 5) S/U.

MAN 6957—International Studies in Management (1-4; max: 12) *Prereq: admission to approved study abroad program and permission of department.* S/U.

MAN 7108—Concepts and Methods in the Behavioral Sciences (3) *Prereq: consent of instructor.* Application of the methodology and empirical findings of the behavioral sciences to business policies and practices.

MAN 7205—Organization Theory (3) *Prereq: consent of instructor.* Consideration of method and study of human behavior in organizational contexts. Focus on organizational structure and environment.

MAN 7275—Organizational Behavior (3) *Prereq: consent of instructor.* Focus on individual and group behavior.

MAN 7925—Workshop in Management (1-3; max: 12) *Prereq: MAN 7108. Required of all doctoral candidates in management.* Readings and research in management. Each student must present a research project for discussion and comment.

MAN 7931—Special Topics in Management (3; max: 9) *Prereq: MAN 7205, 7275, and consent of instructor.* Recent literature and state of the art theory and method in both the decision sciences and the behavioral sciences appropriate for the study of management.

MAN 7933—Seminar in Management (3; max: 9) *Prereq: MAN 7205, 7275, and consent of instructor.* Historical foundations and evolutionary development of management concepts; comparative analysis of management patterns; emerging problems of management interest.

MAN 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.

MAN 7980—Research for Doctoral Dissertation (1-15) S/U.

MARKETING
College of Business Administration

GRADUATE FACULTY 1993-94

Chairman: A. G. Sawyer. *Graduate Coordinator:* C. A. Janiszewski. *Graduate Research Professor:* J. G. Lynch. *Russell Berrie Eminent Scholar:* S. M. Shugan. *Distinguished Service Professors:* J. B. Cohen; J. H. Faricy. *J. C. Penney-Florida Professor in Retail Consumer Behavior:* R. L. Lutz. *Professors:* G. G. Bechtel; J. G. Lynch; A. G. Sawyer. *Associate Professors:* J. W. Alba; J. W. Hutchinson; C. A. Janiszewski. *Assistant Professors:* B. A. Bickart; M. Mantrala; D. G. Mick; K. Raman; S. Ratneshwar.

The Marketing Department offers graduate work leading to the Master of Arts and the Ph.D. in business administration, as well as a concentration in the Master of Business Administration (MBA) program.

The M.A. and Ph.D. programs have admission standards of at least the following: (a) combined verbal and quantitative score of 1250 on the Graduate Record Examination or a score of 600 on the Graduate Management Admission Test; (b) a TOEFL score of 600 (for foreign students); and (c) a record of previous scholastic excellence in either business or a closely related social science discipline (e.g., psychology, sociology). Neither industry experience nor an MBA degree is required.

Both programs offer the opportunity for concentrated study in consumer behavior, marketing management, and quantitative modeling of marketplace phenomena.

The Ph.D. curriculum consists of course work in four areas: breadth, research foundations, the major field, and electives. In addition, students are required to complete a first-year summer research project. Other requirements are outlined in the *General Information* section of this *Catalog*.

The breadth requirement applies only to students entering without prior course work in business and consists of ECP 6705—Economics of Business Decisions or ECO 6115—Microeconomic Theory I, and *any two* of the following: ACG 6065—Financial and Managerial Accounting, FIN 5405—Business Financial Management, MAN

5501—Operations Management, MAN 6245— Organizational Behavior I.

The research foundations requirement is comprised of a set of six courses chosen from the following list: All students take a two-course statistics sequence, STA 4210—Regression Analysis and either STA 4212—Multivariate and Nonparametric Categorical Data Methods or STA 6505—Analysis of Categorical Data. An alternate sequence is STA 4321 and 4322—Mathematical Statistics I and II. A mathematics requirement may be fulfilled by either ECO 6805—Mathematical Methods and Applications to Economics or AEB 4511—Quantitative Analysis in Food and Resource Economics. All students take MAR 7622—Design of Market Research and either MAR 7625—Advanced Statistical Analysis in Marketing Research or STA 6706—Applied Multivariate Methods for Behavior Research or EDF 7432—Advanced Psychometric Theory. Finally, students take a scaling course, either MAR 7627—Subjective Measurement in Marketing and Survey Research or MAR 7628—Multidimensional Scaling for Marketing and Societal Analysis. In some cases, students may substitute more advanced courses for the mathematics and applied statistics requirements.

The major field course work is made up of a set of five required marketing seminars that are completed during the student's first two years in the program. In addition, the student is required to attend MAR 7925—Workshop in Marketing Research, which features presentations by both University of Florida faculty and students and researchers from other institutions. Electives are selected from both advanced marketing seminars and other related disciplines to complement the student's research program. There is no formal minor requirement.

The M.A. curriculum is designed with the primary purpose of serving as a "feeder" to the Ph.D. program. Students take the same course work as Ph.D. students, with the exception that they are required to take fewer electives and courses in the major field. Students may select a nonthesis option, substituting two advanced marketing seminars for the thesis. The normal time for completion of the M.A. program is two years.

MAR 6106—Public Policy Research in Marketing (3) *Prereq: MAR 6506 and 6786 or equivalents, or consent of instructor.* Analysis of regulatory and other public policy programs involving marketing practices which impact on the consumer. Emphasis on the role of consumer research in resolution of public policy issues.
MAR 6158—International Marketing (4) *Prereq: MAR 6805.* Analysis and strategies for marketing in the international environment.
MAR 6336—Promotional Strategy and Planning (4) *Prereq: MAR 6805.* Stresses the development of integrated promotional objectives and strategy based upon a detailed analysis of the market and company.
MAR 6506—Consumer Behavior (3) *Prereq: admission to M.A. or Ph.D. in marketing or consent of instructor.* Theory and research in the behavioral and social sciences applied to individual and aggregate behavior of consumers.
MAR 6636—Research Methods in Marketing (3) *Prereq: admission to M.A. or Ph.D. in marketing or consent of instructor.* Experimental and quasi-experimental design; procedures for laboratory and field experiments; statistical conclusion, internal, external, and construct validity in research design; reliability and validity in measurement; creativity in hypothesis generation and theory testing in behavior research.
MAR 6646—Marketing Research for Managerial Decision Making (4) *Prereq: MAR 6805 and QMB 5305.* Examination of approaches and methods of marketing research with particular attention given to the perspective of the marketing manager.
MAR 6666—Marketing Decision Models (3) *Prereq: ECO 6805 and STA 4210 or equivalents and departmental approval.* Development and implementation of model-based approaches to marketing decision making. Model-based analysis of advertising, pricing, promotion, distribution. Research project.
MAR 6786—Marketing Literature (3) *Prereq: admission to M.A. or Ph.D. in marketing or consent of instructor.* Survey of academic marketing literature, with special focus on conceptual and empirical studies of marketing strategy and marketing program variables.
MAR 6805—Problems and Methods in Marketing Management (3) *Prereq: ACG 6065, QMB 5305. Designed for MBA candidates.* Concepts and techniques for resolving marketing management problems through the case method.
MAR 6816—Advanced Marketing Management (4) *Prereq: MAR 6805.* Advanced case course dealing with the wide range of strategic problems faced by the marketing manager.
MAR 6905—Individual Work (1-4; max: 8) *Prereq: consent of department.* Reading and/or research.
MAR 6910—Supervised Research (1-5; max: 5) S/U.
MAR 6933—Special Topics in Marketing (4; max: 8) *Prereq: consent of instructor.* Selected topics in marketing management, research, or theory. MBA students limited to 4 credits.
MAR 6940—Supervised Teaching (1-5; max: 5) S/U.
MAR 6957—International Studies in Marketing (1-4; max: 12) *Prereq: admission to approved study abroad program and permission of department.* S/U.
MAR 6971—Research for Master's Thesis (1-15) S/U.
MAR 7507—Perspectives on Consumer Behavior (3) *Prereq: admission to M.A. or Ph.D. in marketing or consent of instructor.* An in-depth analysis of the field. A variety of theoretical and methodological approaches critically examined through marketing and consumer behavior literatures. Students required to develop an original research project.
MAR 7588—Consumer Information Processing and Decision Making (3) *Prereq: MAR 7622 and 6506 or 7507 or consent of instructor.* In-depth treatment of consumer information processing and choice behavior as a function of psychological and environmental factors. Underlying concepts and theories of individual judgment and decision making; critical evaluation of research in this area. Students required to develop a research project.
MAR 7622—Design of Marketing Research (3) *Prereq: STA 4210 or equivalent, and consent of instructor.* Emphasis on the design, execution, analysis, and interpretation of experiments in marketing.
MAR 7625—Advanced Statistical Analysis in Marketing Research (3) *Prereq: MAR 7622 or approval of instructor.* Introduction and application of multivariate statistical analysis. Theory and assumptions of analysis methods and their use in selected marketing applications. Students required to develop a project using computer-based statistical analysis packages.
MAR 7627—Subjective Measurement in Marketing and Survey Research (3) *Prereq: STA 4210 or equivalent and consent of instructor.* Scaling of consumer ratings and comparative judgment questionnaire methods for construct measurement item response theory, reliability, survey sampling, modeling cross-classification data.
MAR 7628—Methods for Analysis of Proximity and Choice Data (3) *Prereq: STA 4210 and 4212 or equivalent or consent of instructor.* Mathematical models, proximity and choice data, including multidimensional scaling, cluster analysis, and models of discrete choice and brand-switching.
MAR 7925—Workshop in Marketing Research (3; max: 9) *Prereq: departmental approval.* In-depth analysis of current research topics. Emphasis on research programs of leading scholars. Students critically appraise the rationale, strengths, and weaknesses of each study.
MAR 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students

with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.

MAR 7980—Research for Doctoral Dissertation (1-15) S/U.

MASS COMMUNICATION
College of Journalism and Communications

GRADUATE FACULTY 1993-94

Dean: R. L. Lowenstein. *Assistant Dean for Graduate Studies:* J. W. Wright. *Joseph L. Brechner Eminent Scholar in Freedom of Information:* W. F. Chamberlin. *Distinguished Service Professor:* M. N. Edwardson. *Professors:* J. W. Anderson; G. A. Butler; K. A. Christiansen (*Emeritus*); J. S. Detweiler; M. A. Ferguson; J. L. Griffith; L. J. Hooper (*Emeritus*); R. L. Kendall; K. Kent; K. M. Lancaster; R. L. Lowenstein; D. H. Ostroff; F. N. Pierce; R. N. Pierce (*Emeritus*); J. R. Pisani; J. A. Roosenraad; G. P. Smeyak; F. L. Smith; J. L. Terhune; L. P. Tipton; E. L. Wagner; J. W. Wright. *Associate Professors:* C. E. Burke; J. E. Dodd; M. S. Fregly; F. A. Hammond; A. J. Jacobs (*Emeritus*); W. L. McKeen; J. D. Morris; J. C. Sutherland; E. G. Weston. *Assistant Professors:* M. Leslie; H. S. Pactor; K. B. Walsh-Childers; M. F. Weigold.

Through its graduate division, the College of Journalism and Communications offers the Doctor of Philosophy degree and the Master of Arts in Mass Communication (thesis or nonthesis option). Doctoral students work closely with faculty members in research leading to a dissertation embodying a humanities, law/policy, or social sciences approach. Emphases within these approaches for which faculty members have expertise include advertising, international communication, journalism, political communication, public relations, and telecommunication. Details of doctoral faculty research interests and other aspects of the program are given in the College's Ph.D. Handbook.

Master's students may write a thesis in advertising, communication research, international communication, journalism, public relations, or telecommunication. Nonthesis students choose from advertising, journalism, political campaigning, public relations, and telecommuni-cation. With the approval of the Assistant Dean for Graduate Studies and other faculty members, master's students may develop an individualized program of study, with thesis, to meet their specific needs and interests.

Mass Communication/Law Joint Degree Program.—A four-year program leading to the Master of Arts in Mass Communication and the Juris Doctor is offered under the joint auspices of the College of Journalism and Communications and the College of Law. The program provides students interested in scholarship or practice of communication law, or in reporting on the law, with the opportunity to blend relevant work from the two colleges. Students must meet the entrance requirements of both colleges. A thesis is required. Interested students should apply for admission to both the Graduate School and the College of Law, noting on the applications the joint nature of the admission requests. Admission to the two programs must be simultaneous. Further information on the program and on application procedures is available from the Holland Law Center and from the Graduate Division of the College of Journalism and Communications.

Admission is granted to applicants with and without background in mass communication. Students without academic preparation in mass communication or appropriate experience may be required to take articulation work. These courses are taken concurrently with general graduate courses, starting in the first term of registration. Including articulation courses, the master's degree normally can be earned in one and one-half or two years of full-time study. Doctoral studies require three or more years of full-time study and research. Students who may require articulation courses should contact the Assistant Dean for Graduate Studies.

Master's students with inadequate preparation in the social sciences and humanities must demonstrate knowledge of the basics of selected subjects. For U.S. citizens, the subjects are economics, statistics, American history, federal government, and state and local government. Students arrange with their academic advisers the means of demonstrating knowledge. Specific College requirements are given in the Master's Handbook.

Any student who receives one grade below "C+" but above "D+" will be placed on academic probation. A requirement of the probation is the student must achieve or maintain a cumulative grade point average of 3.0 or higher at the end of the next academic term in residence. A student who fails to satisfy the requirement will be suspended. A student who accumulates two grades below "C+" but above "D+" during graduate studies will be suspended, as will a student who receives one grade of "D+" or lower at any time.

ADV 5005—Advertising Planning (3) Introduction to the process of developing advertising strategy, emphasizing theory and research methods.

ADV 6305—Advanced Media Planning (3) *Prereq: ADV 4300, MMC 6421, or equivalents.* Media planning to meet advertising goals. Use of research findings. Computer models.

ADV 6503—Advertising Creative Strategy and Research (3) *Coreq: MMC 6421 or equivalent.* Social science findings as guides for decisions. Use of consumer behavior concepts in shaping advertising message content and improving media selection.

ADV 6602—Advertising/Public Relations Management (3) *Prereq: ADV 6305 and 6503, or PUR 6415, or consent of instructor.* Application of management principles and practice to effective development of advertising/public relations plans. Case studies and discussion of current problems in research, planning, operations, administration, and evaluation.

COM 6315—Advanced Research Methods (3; max: 6) *Prereq: MMC 6421 and STA 6126 or equivalents, and consent of instructor.* Scientific method, measurement, analysis. Student research required.

COM 6940—Supervised Teaching (1-3; max: 5) S/U.

FIL 6101—Advanced Radio, Television, and Film Writing (3) *Prereq: consent of instructor.* Forms, techniques, and types of writing as they apply to radio, television, and film.

JOU 5007—History of Journalism (3) Origin, development, and potentiality of print and broadcast media. Evolution of standards, policies, methods, and controls.

JOU 5705—Issues and the Press (3) Influence of the press in defining and shaping public concern with major social issues.

JOU 6190—Newsroom Management (3) Internal problems of newspaper operation. Status of personnel, effects of technological developments, news decision-making, defining objectivity, improving news coverage.

JOU 6195C—Advanced Reporting Workshop (6) *Prereq: JOU 4104 and MMC 5206L or equivalents, or consent of instructor.* Depth reporting theory and practice.

JOU 6501—Newspaper Production and Management (3) *Prereq: consent of instructor.* Newspaper business management, good will, budgets, accounting, labor relations, taxes, legal questions, postal regulations, newspaper promotion, circulation, advertising problems, weekly and small daily publishing.

JOU 6892—Seminar in Journalism as Literature (3) Analysis of mass media writing, broadcast programs, and graphics to assess their merits both as journalism and as art. Various periods studied; emphasis on 20th century.

MMC 5005—Mass Communication History (3) Origin, development, and potentiality of print and electronic media. Evolution of standards, policies, methods, controls.

MMC 5015—Electronic Publishing (3) Services and technology of major forms of electronic publishing and videotex. Nature and economics of information. Impact of new mass communication technologies.

MMC 5206L—Advanced Law of Mass Communication (3) Problems of constitutional law, libel, privacy, and governmental regulation. Not open to students who have taken MMC 4200 or equivalent.

MMC 5306—International Communication (3) Analysis and comparison of print and electronic communication systems among nations and cultures; barriers and stimuli to international communications; mass media in national development.

MMC 5315—Survey of Foreign Correspondence (3) Nature and history of foreign correspondence. Impact on nations and international relations.

MMC 6202—Legal Problems of Mass Communication (3) *Prereq: MMC 5206L or equivalent.* Constitutional interpretation, conflicts between media and rights of others, regulation, the nature of jurisprudence.

MMC 6307—Seminar in International Communication (4; max: 8) *Prereq: MMC 5306 or equivalent, and consent of instructor.* Specialized or regional aspects of international communication; in-depth investigation of particular concepts and research literature. Student research required.

MMC 6400—Mass Communication Theory (3) Structure, content, process, effects of communication; contributions of other disciplines, e.g., semantics, linguistics, learning theory; barriers to effective communication; use of research concepts.

MMC 6402—Seminar in Mass Communication Theory (4; max: 16) *Prereq: MMC 6400, 6421, or equivalents, statistics, and consent of instructor.* Specialized aspects of mass communication theory; in-depth investigation of particular concepts and research literature. Student research required.

MMC 6405—Seminar in Mass Communication and Public Opinion (4) *Prereq: MMC 6400, 6421 or equivalents, and consent of instructor.* Conceptualizations of public opinion as a collective process; role of mass communication in describing and shaping perceptions of public opinion. Student research required.

MMC 6421—Research Methods in Mass Communication (3) Introduction to experiments, surveys, content analysis, sampling, measurement. Laboratory applications.

MMC 6560—Seminar in History of Mass Communication (4; max: 8) *Prereq: JOU 5007, MMC 5005, RTV 5005, or equivalent, and consent of instructor.* Reading, critical study. Advanced investigative report on an approved research subject.

MMC 6565—Seminar in History of Mass Media Content (4; max: 8) *Prereq or coreq: HIS 6060, 6061, MMC 5005, or equivalents, and consent of instructor.* History of subject matter—concerns, themes, focus, purpose, and style. Reading, critical study. Possible topics: rise of objectivity in news reporting, the documentary, investigative reporting, and yellow journalism.

MMC 6566—Seminar in History of Mass Media Institutions (4; max: 8) *Prereq or co coreq: HIS 6060, 6061, MMC 5005, or equivalents, and consent of instructor.* Emergence and growth of mass media infrastructure, support organizations, and related entities. Reading, critical study. Possible topics: rise of newspaper chains, role of media unions, development of newspapers into big business, history of media financial support systems.

MMC 6660—Mass Communication and Society (3) Rights, responsibilities, ethics of communication media; government and media; economic, political, and social determinants of media content.

MMC 6662—Seminar in Mass Communication and Society (4; max: 8) *Prereq: MMC 6660 or equivalent, and consent of instructor.* Specialized aspects of mass communication and society; in-depth investigation of particular concepts and research literature. Student research required.

MMC 6665—Seminar in First Amendment Theory (4) *Prereq: MMC 5206L or equivalent, and consent of instructor.* Investigation into meaning and purpose of press, speech, petition, and assembly clauses of First Amendment. Offered in fall semester, even-numbered years.

MMC 6666—Seminar in Research in Mass Communication Law (4) *Prereq: MMC 5206L or equivalent, and consent of instructor.* Investigation of legal research techniques for the mass communication scholar and of literature of a particular mass media law topic. Offered in fall semester, odd-numbered years.

MMC 6667—Seminar in Advanced Topics in Mass Communication Law (4) *Prereq: MMC 6666 or LAW 5792 or equivalent, and consent of instructor.* Execution of individual or group research project on specialized topic under close supervision of instructor. Offered in spring semester, even-numbered years.

MMC 6668—Seminar in Public Policy Toward Mass Media (4) *Prereq: MMC 5206L and RTV 5702 or equivalents, and consent of instructor.* Examination and application of major theoretical perspectives of public policy-making as they apply to the American mass media. Offered in fall semester, even-numbered years; spring semester, odd-numbered years.

MMC 6669—Seminar in Standards of Media Criticism (4) *Prereq: MMC 6660 and consent of instructor.* Comparative study of standards for criticizing news performance developed by major institutions of media criticism, including press councils, government commissions, ombudsmen, media reviews, etc.

MMC 6905—Individual Work (1-3; max: 9) Reading or research.

MMC 6910—Supervised Research (1-3; max: 5) S/U.

MMC 6920—Communication Proseminar (1) *Required at beginning of each student's program.* Introduction to mass communication and graduate study. S/U.

MMC 6929—Communication Colloquium (1: max: 8) S/U.

MMC 6930—Seminar in Mass Communication Teaching (3) Research and training for teaching and supervision of student mass media.

MMC 6936—Special Topics in Mass Communication (1-3; max: 6) *Prereq: consent of instructor or graduate adviser.*

MMC 6949—Professional Internship (1-3; max: 3) Training in an approved mass communication office; instructor receives reports from on-site supervisor. S/U.

MMC 6971—Research for Master's Thesis (1-15) S/U.

MMC 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.

MMC 7980—Research for Doctoral Dissertation (1-12) S/U.

PUR 6415—Public Relations Processes (3) Processes of communication as applied to public relations; interorganizational theory, decision-making, issue identification and analysis, and conflict cooperation assessment.

PUR 6934—Problems in Public Relations (3) *Prereq: PUR 6415 or equivalent.* Specialized topics, case studies, community relations, analysis of public relations problems in the light of theory.

RTV 5702—Telecommunication Regulation (3) Legal structure of radio, television, cable, satellite, and new media forms; Communication Act, Federal Communications Commission.

RTV 6508—Audience Analysis (3) Methods of audience analysis.

Survey research, sampling, and program content analysis. Analysis of secondary audience data.

RTV 6801—Broadcast Station Management (3) Station organization, operational policies, market research, programming policy, network affiliation, federal and state regulations governing the broadcast industry, FCC procedures.

RTV 6807—Telecommunication Outlet Systems and Practices (3) Structural and procedural elements of broadcast stations, cable systems, and other local radio-television facilities. Review of research and models in telecommunications administration, economic planning and control, merchandising and positioning, sales and advertising.

MATERIALS SCIENCE AND ENGINEERING
College of Engineering

GRADUATE FACULTY 1993-94

Chairman: R. Abbaschian. *Assistant Chairman:* R. G. Connell, Jr. *Graduate Coordinators:* C. D. Batich; P. H. Holloway. *Graduate Research Professor:* L. L. Hench. *Distinguished Service Professor:* E. D. Verink, Jr. *Professors:* G. J. Abbaschian; C. D. Batich; C. L. Beatty; D. E. Clark; R. T. DeHoff; E. P. Goldberg; R. W. Gould *(Emeritus);* P. H. Holloway; R. E. Hummel; J. J. Mecholsky, Jr.; B. M. Moudgil; R. Park R. E. Reed-Hill *(Emeritus);* M. D. Sacks; J. H. Simmons; E. D. Whitney. *Associate Professors:* J. H. Adair; J. R. Ambrose; R. G. Connell, Jr.; F. Ebrahimi; K. S. Jones; M. J. Kaufman. *Associate Engineer:* S. R. Bates. *Assistant Professors:* A. B. Brennan; R. K. Singh.

The Department of Materials Science and Engineering offers the Master of Science, Master of Engineering, Doctor of Philosophy, and the Engineer degrees. Degrees may be obtained with specialization in metal, ceramic, polymeric or electronic materials.

Specific areas of concentration within the Department include biomaterials, ceramics, corrosion, diffusion, glasses, mechanical behavior, quantitative microscopy, mineral processing, reaction kinetics in the solid state, structural analysis, composites, compound semiconductors, optoelectronic materials, integrated circuit materials, and high temperature superconductors.

The minimum requirement for admission to the program is a bachelor's degree in materials science and engineering or in a related field. Graduate students who can present the prerequisites for graduate courses without having to take more than 12 credits in advanced undergraduate courses will be considered to have fulfilled this requirement.

EMA 5108—Vacuum Science and Techonology (3) *Prereq: CHM 2045, PHY 3042, MAP 3302, or consent of instructor.* Introduction to the generation and use of vacuum for scientific research and industrial production. Kinetic theory of gases discussed as necessary to understand vacuum phenomena. Description of components and materials, vacuum systems design and uses in metallurgy, electronics, physics, and chemistry.

EMA 5110—Electron Theory of Solids for Materials Scientists I (3) Wave equation and its application to free electrons, bound electrons, and electrons in crystals. Electron-band theory and its applications. Electrical properties of metals, alloys, and semiconductors, heat capacity and thermal properties.

EMA 6005—Deposition and Properties of Thin and Thick Films (3) *Prereq: EMA 3010, CHM 2046, PHY 3040.* Techniques for depositing thin metallic semiconductor and dielectric films. The relationships between deposition technique and thin film properties. Properties unique to thin films.

EMA 6105—Fundamentals and Applications of Surface Science (3) *Prereq: CHM 2045, PHY 3042, MAP 3302, or consent of instructor.* Fundamental and experimental description of phenomena occurring at the surface of solids, including structure, composition, atomic and molecular processes, and electronic properties. Experimental approaches and data used to support theoretical models.

EMA 6106—Advanced Phase Diagrams (3) Phase diagrams considering systems with as many as four components; emphasis on pressure-temperature-composition diagrams.

EMA 6111—Electron Theory of Solids for Materials Scientists II (3) Atomistic (classical) and electron theory of optical properties of metals, alloys, and dielectrics. Nonlinear optics, lasers. Raman-spectra.

EMA 6126—Advanced Physical Metallurgy I (4) *Prereq: EMA 4125.* Energetics of phase transformations; spinodal decomposition, heterogeneous and homogeneous nucleation in solid state reactions.

EMA 6127—Advanced Physical Metallurgy II (4) *Prereq: EMA 6126.* Growth and dissolution of particles in solids; cellular growth; coarsening, martensite transformations; sintering and other solid state processes.

EMA 6129—Rapid Solidification Processing (2) *Prereq: EMA 4125 or equivalent.* Theories of rapid solidification, micro- and macrosegregation, metastable phase diagrams and metallic glasses. Rapid solidification technology, including powder techniques, melt spinning, laser and electron processing of materials.

EMA 6136—Diffusion in Solids (3) *Prereq: EMA 4125.* Physical basis, equation, and theories of diffusion, tracer, chemical, multicomponent, and multiphase diffusion in general force fields.

EMA 6141—Emerging Technologies in Ceramic Engineering (3) Ceramic composites, coatings, joining fabrication, chemical synthesis, and other emerging technologies.

EMA 6146—Atomic Processes in Crystalline Ceramics (3) Processes leading to the control of thermal and mechanical properties of ceramics through microstructure. High temperature reactions involving solids, diffusion, grain growth, and phase transformations in ceramic systems. Sintering phenomena.

EMA 6147—Structure and Properties of Glasses I (3) Theory of glass structure, phase separation, nucleation, crystallization, glass-ceramics. Influence of composition, structure, and environment on physical and surface properties.

EMA 6148—Structure and Properties of Glasses II (3) Chemical, electrical, magnetic, and mechanical properties of glasses.

EMA 6165—Polymer Physical Science (3) *Prereq: EMA 3066.* Solid-state properties of amorphous and semi-crystalline polymers.

EMA 6166—Polymer Composites (3) Physical and mechanical properties of polymers and polymer composites as related to preparation and microstructure.

EMA 6226—Advanced Mechanical Metallurgy I (3) *Prereq: EMA 4223.* Dislocation theory, microstructural effects in mechanical properties, strengthening mechanisms, fracture, and other current topics.

EMA 6227—Advanced Mechanical Metallurgy II (3) Continuation of EMA 6226.

EMA 6246—Fracture of Brittle Materials (3) *Prereq: EMA 4223, EGM 3520, or equivalent.* Latest concepts in deformation, fracture, and toughening of brittle materials. Application of fracture mechanics and fractals to failure of brittle materials. Development of an approach to failure analysis for brittle materials.

EMA 6265—Mechanical Properties of Polymers (3) *Prereq: EMA 3066.* Linear and nonlinear viscoelastic behavior of polymers with emphasis on molecular and microstructure aspects.

EMA 6265L—Polymer Mechanical Properties Laboratory (2) *Prereq: EMA 3066. Coreq: EMA 6265.* Mechanical property

testing in linear and nonlinear viscoelastic regimes of polymeric materials.

EMA 6316—Materials Thermodynamics (3) *Prereq: EMA 4314.* Thermodynamics of materials systems; surfaces in solids, irreversible processes.

EMA 6326—Advanced Topics in Corrosion (2) *Prereq: EMA 4324.* Theories and mechanisms of corrosion. Current literature on oxidation and corrosion.

EMA 6411—Quantum Well Materials (3) Fabrication and characterization of quantum well heterostructure materials; optical and electronic properties of carriers confined in quantum wells.

EMA 6446—Electronic Processes in Crystalline Ceramics (3) *Prereq; EMA 4145 or consent of instructor.* The defect solid state and its relation to electrical properties of ceramic materials. Ionic conductivity in ceramics. Solid electrolytes. Theory of electron transport in metallic, semiconducting, and insulating ceramics.

EMA 6448—Ceramic Processing (3) Introduction to the science of ceramic processing, with emphasis on theoretical fundamentals. Examples of state-of-the-art industrial processes discussed.

EMA 6461—Polymer Characterization (3) *Prereq: EMA 3066.* Use of broad variety of spectroscopic and other scattering phenomena in polymer research.

EMA 6507C—Scanning Electron Microscopy and Electron Probe Microanalysis (3) *Prereq: EMA 3513.* Fundamentals of scanning electron microscopy and electron probe microanalysis. Laboratory.

EMA 6518—Transmission Electron Microscopy (3) *Prereq: EMA 3513.* Instrumentation associated with transmission electron microscopy. Kinematical and dynamical theories of diffraction contrast and their application. Diffraction analysis in TEM for structural determination. Analytical techniques for obtaining structural and compositional information at high spatial resolution. Phase contrast and high resolution electron microscopy.

EMA 6518L—Transmission Electron Microscopy Laboratory (1) Specimen preparation for analysis in TEM. Demonstration of principles of contrast theories. Specialized methods for characterizing structure and composition of materials at high spatial resolution.

EMA 6519L—Specialized Research Techniques in Materials Science (1-2; max: 10) Utilizing primarily STEM, TEM, SEM, EMP, FIM, and optical metallography.

EMA 6580—Science of Biomaterials I (3) *Prereq: undergraduate chemistry.* Introduction to variables that control compatibility and performance of biomaterials, including physical and chemical properties, corrosion, fatigue, and interfacial histochemical changes.

EMA 6581—Science of Biomaterials II (3) *Prereq: undergraduate chemistry.* Anatomical variables, stresses, materials selection, and selected literature readings.

EMA 6625—Advanced Metals Processing (3) *Prereq: EMA 4125.* Advanced treatment of solidification phenomena during metals processing. Topics to include nucleation, kinetics, solidification structure, segregation, and effects of processing variables on structure and properties.

EMA 6667—Polymer Processing (2-3; max: 3) *Prereq: EMA 3066; coreq: EMA 6667L.* Major processing methods for polymers and polymeric composites as related to the rheological behavior of these systems. Synthesis of polymers via industrial processes.

EMA 6667L—Polymer Processing Laboratory (2) *Prereq: EMA 3066; coreq: EMA 6667.* Use of polymer processing equipment; industrial methods for synthesizing polymers.

EMA 6805—Mathematical Methods in Materials Science I (2) Review of mathematical methods with emphasis upon applications in materials science and engineering.

EMA 6806—Mathematical Methods in Materials Science II (2) *Prereq: EMA 6805 or equivalent.* Applications of advanced differential equations, transform methods, and computational analysis.

EMA 6905—Individual Work in Materials Science and Engineering (1-4; max: 8)

EMA 6910—Supervised Research (1-5; max: 5) S/U.

EMA 6936—Seminar in Materials Science and Engineering (1; max: 14) Offered in fall and spring. Required of all students. S/U.

EMA 6937—Seminar in Metallurgy and Ceramic Science (1-2; max: 18) S/U.

EMA 6938—Special Topics in Materials Science and Engineering (1-4; max: 6)

EMA 6940—Supervised Teaching (1-5; max: 5) S/U.

EMA 6971—Research for Master's Thesis (1-15) S/U.

EMA 6972—Research for Engineer's Thesis (1-15) S/U.

EMA 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.

EMA 7980—Research for Doctoral Dissertation (1-15) S/U.

MATHEMATICS
College of Liberal Arts and Sciences

GRADUATE FACULTY 1993-94

Chairman: J. Glover. *Associate Chairman:* C. W. Nelson. *Graduate Coordinator:* J. A. Larson. *Graduate Research Professor:* R. E. Kalman. *Professors:* K. Alladi; A. R. Bednarek; L. S. Block; B. L. Brechner; J. K. Brooks; D. A. Cenzer; N. Dinculeanu; D. A. Drake; B. H. Edwards; P. E. Ehrlich; G. G. Emch; J. Glover; W. W. Hager; C. Y. Ho; J. E. Keesling; J. R. Klauder; J. A. Larson; J. Martinez; W. J. Mitchell; C. W. Nelson; V. M. Popov; Z. R. Pop-Stojanovic; M. Rao; G. X. Ritter; G. R. Robinson; A. Turull; A. K. Varma; A. Vince; N. L. White; D. C. Wilson. *Associate Professors:* R. M. Crew; F. G. Garvan; D. J. Groisser; J. L. F. King; B. Mair; T. O. Moore; P. L. Robinson; S. A. Saxon; L. C. Shen; K. N. Sigmon; P. Sin; R. Smith; C. W. Stark; S. J. Summers; H. K. Voelklein; T. Walsh. *Assistant Professors:* L. Flaminio; S. A. McCullough; C. Y. Xu.

The Department of Mathematics offers the degrees of Doctor of Philosophy, Master of Science and Master of Arts, and the Master of Arts in Teaching and Master of Science in Teaching, each with a major in mathematics.

The Department also has an accelerated bachelor's/master's program designed for superior undergraduate students who have the ability to pursue such a plan of study leading to the Master of Science or Master of Arts degree. The main feature of the program is that up to 21 semester hours of approved graduate level mathematics courses may be used as dual credit for both the undergraduate and the graduate degree. All other requirements for both the bachelor's degree and the master's degree must be met. For admission requirements for this program, see the Associate Chair for the Undergraduate Program.

There are opportunities for concentrated study in a number of specific areas of pure and applied mathematics at both the master's and doctoral levels. The faculty directs studies and research in algebra, number theory, analysis, geometry, topology, logic, differential equations, dynamical systems, control theory, probability theory, mathematical systems theory, numerical analysis, approximation theory, combinatorial analysis, graph theory, computer applications, biomathematics, and mathematical physics.

In addition to the requirements of the Graduate School, the minimum prerequisite for admission to the program of graduate studies in mathematics is the completion, with an average grade of B or better, of at least 24 credits of

undergraduate mathematics, including a full year of calculus and three semesters of appropriate work beyond the calculus. The most appropriate courses for this purpose are advanced calculus, abstract algebra, and linear algebra. Students lacking part of the requirements will be required to make up the deficiency early in their graduate work.

Prerequisites to individual courses should be determined before registration by consultation with the instructor concerned.

Some of the courses listed are offered only as needed. Since times of offering courses are estimated a year in advance, certain changes may be made if needs are known by the department.

The courses MAA 5228, 5229, MAS 5311, and 5312 are required for all advanced degree programs in mathematics.

The requirements for the master's degree include 32 semester hours of course work and a comprehensive written examination. A thesis is not required. There are two master's specializations available, one in pure mathematics and one in applied mathematics. A student normally takes two years to complete either program.

The requirements for a doctoral degree include 36 hours of 6000-level course work in mathematics. No hours of teaching, colloquium, dissertation, or individual work will count toward this requirement.

The doctoral student must pass a written and oral comprehensive preliminary examination administered by the Department to become a candidate for the degree. The doctoral student must pass reading knowledge examinations in one of the following foreign languages: French, German, or Russian.

The dissertation is an important requirement for the doctoral degree in mathematics. The topic for the dissertation may be chosen from a number of areas of current research in pure and applied mathematics.

Every graduate student is expected to attend the regular colloquium.

Details concerning all requirements for graduate degrees in mathematics may be obtained by writing the Mathematics Department Graduate Selection Committee.

MAA 5104—Advanced Calculus for Engineers and Physical Scientists I (3)

MAA 5105—Advanced Calculus for Engineers and Physical Scientists II (3) *Prereq: MAA 5104.*

MAA 5228—Modern Analysis I (3) *Prereq: MAC 3313.* Topology of metric spaces, numerical sequences and series, continuity, differentiation, the Riemann-Stieltjes integral, sequences and series of functions, the Stone-Weierstrass theorem, functions of several variables. Stokes' theorem, the Lebesgue theory.

MAA 5229—Modern Analysis II (3) *Prereq: MAA 5228.*

MAA 5404—Introduction to Complex Variables for Engineers and Physical Scientists (3)

MAA 5506—Introduction to Functional Analysis I (3)

MAA 5507—Introduction to Functional Analysis II (3) *Prereq: MAA 5506.*

MAA 6236—Mathematical Analysis for Statisticians (4) *Coreq: STA 6326.* Numerical sequences and series, limits, continuity, differentiation, integration, series of functions. Applications to probability and statistics stressed.

MAA 6406—Complex Analysis I (3) *Prereq: MAA 5229.* Rapid survey of properties of complex numbers, linear transformations, geometric forms and necessary concepts from topology. Complex integration. Cauchy's theorem and its corollaries. Taylor series and the implicit function theorem in complex form. Conformality and the Riemann-Caratheodory mapping theorem. Theorems of Bloch, Schottky, and the big and little theorems of Picard. Harmonicity and Dirichlet's problems.

MAA 6407—Complex Analysis II (3) *Prereq: MAA 6406.*

MAA 6616—General Theory of Measure and Integration I (3) *Prereq: MAA 5229.* Borel sets, measurable functions and the monotone class theorem. Measures and their extension theorems, Lebesgue integral, convergence theorems. Product measures and Fubini's theorem, the Radon-Nikodym theorem and differentiation. Elementary Hilbert and Banach space theory, LP-spaces.

MAA 6617—General Theory of Measure and Integration II (3) *Prereq: MAA 6616.*

MAA 7526—Advanced Topics in Functional Analysis I (3; max: 6) *Prereq: MAA 6617, MAS 6332.* Algebraic and topological approach to current material and methods in analysis.

MAA 7527—Advanced Topics in Functional Analysis II (3; max: 6) *Prereq: MAA 7526.*

MAD 5405—Numerical Methods of Differential Equations (3) *Prereq: MAS 3113, 3114, or 4105; and programming language.* Numerical methods for the solution of differential equations.

MAD 6206—Combinatorial Theory I (3) Matching theory, Ramsey's theorem, lattice theory, Mobius inversion, generating functions. Polya's theorem, matroids, applications, block designs, graph theory.

MAD 6207—Combinatorial Theory II (3) *Prereq: MAD 6206.*

MAD 6406—Numerical Linear Algebra (3) *Prereq: MAS 3114, 4105, or 4124; and programming language.* Topics most useful in applications with emphasis on numerical techniques: systems of linear equations, positive definite and toeplitz systems, least squares problems, singular value decomposition, and eigenvalues. Numerical stability and efficiency of algorithms as well as effect of perturbations on the problem. Companion to MAD 6407.

MAD 6407—Numerical Analysis (3) *Prereq: MAA 4212, 5105, or 5229; and programming language.* Numerical techniques to solve systems of nonlinear equations to approximate functions, to compute derivatives, to evaluate integrals, and to integrate systems of differential equations. Introduction to numerical techniques for partial differential equations. Companion to MAD 6406.

MAD 7396—Topics in Combinatorial Theory I (3; max 6) *Prereq: MAS 5312.* Topics chosen from among graph theory, coding theory, matroid theory, finite geometries, projective geometry, difference methods, and Latin squares.

MAD 7397—Topics in Combinatorial Theory II (3; max: 6) *Prereq: MAD 7396*

MAE 6940—Supervised Teaching (1-5; max: 5) S/U.

MAE 6943—Internship in College Teaching (3; max: 6) *Prereq: consent of graduate adviser.*

MAP 5304—Intermediate Differential Equations for Engineers and Physical Scientists (3)

MAP 5345—Introduction to Partial Differential Equations (3)

MAP 6208—Numerical Optimization (3) *Prereq: MAD 6406 and 6407 or permission of instructor.* Unconstrained and constrained optimization, linear and nonlinear programming, gradient, multiplier, and quasi-Newton methods. Penalty, multiplier, and projection methods for constrained problems.

MAP 6217—Introduction to Calculus of Variations for Engineers and Physical Scientists (3) *Prereq: MAP 5304, MAS 5157 or equivalent.* Extremum problems, first variation. Euler equation problems with fixed and movable boundaries. Lagrange multiplier methods for problems with constraints, canonical form, second variation, applications to physics and engineering.

MAP 6327—Applied Differential Equations I (3) *Prereq: MAA 5229.* Theory and methods for solving linear and nonlinear systems of differential equations and partial differential equations. Applications and computer techniques included.

MAP 6328—Applied Differential Equations II (3) *Prereq: MAP 6327.*

MAP 6356—Partial Differential Equations I (3) *Prereq: MAA 5229, MAP 5345 or 6506.* Cauchy-Kowalewski theorem, first order equations, classification of equations, hyperbolic equa-

tions, elliptic equations, parabolic equations, hyperbolic systems, nonlinear hyperbolic systems, existence theory based on functional analysis. Applications to physical sciences.

MAP 6357—Partial Differential Equations II (3) *Prereq: MAP 6356.*

MAP 6375—Numerical Partial Differential Equations (3) *Prereq: MAD 6406 and 6407 or permission of instructor.* Introduction to partial differential equations and fundamental concepts. Parabolic equations: finite differences, consistency, convergence and stability, two- and three-dimensional problems. Elliptic equations: finite differences, solution to linear equations, boundary integral equation methods. Hyperbolic equations: finite differences and method of characteristics. Introduction to finite elements. Methods of lines.

MAP 6376—Finite Element Method (3) *Prereq: MAD 6406 and 6407 or permission of instructor.* Variational formulations of partial differential equations, finite element approximations, both theoretical framework and numerical issues addressed. Finite element spaces in one, two, and three dimensions, error analysis, nonconforming finite element spaces, isoparametric approximations to boundary conditions.

MAP 6417—Fourier Series I (3) *Prereq: MAP 6505.* Fundamental theorems on convergence, differentiation, and integration. Applications to boundary value problems.

MAP 6418—Fourier Series II (3) *Prereq: MAP 6417.*

MAP 6445—Approximation Theory (3) *Prereq: MAD 6406 and 6407 or permission of instructor.* Polynomial approximation, spline approximation, piecewise polynomials, interpolation theory, quadrature theory, inequalities in polynomials.

MAP 6467—Stochastic Differential Equations and Filtering Theory I (3) Introduction to random functions; the Brownian motion process. Ito's stochastic integral; Ito's stochastic calculus; stochastic differential equations. Linear filtering; Kalman filtering; nonlinear filtering theory.

MAP 6468—Stochastic Differential Equations and Filtering Theory II (3) *Prereq: MAP 6467.*

MAP 6472—Probability and Potential Theory I (3) *Prereq: MAA 5229 or STA 6326.* Random variables, independence and conditioning. Laws of large numbers and the Central Limit Theorem. Stochastic processes, martingales, Gaussian processes, Markov processes, potentials and excessive functions.

MAP 6473—Probability and Potential Theory II (3) *Prereq: MAP 6472.*

MAP 6487—Biomathematics Seminar I (3) *Prereq: MAC 3312, MAP 3302, STA 6326 or MAP 4102.* Stochastic processes, differential equations, and reaction-diffusion equations used to model various biological processes. Among the applications covered are the following: population dynamics, epidemiology, genetics, enzyme kinetics, cell differentiation and morphogenesis, nerve impulse generation, and aggregation of slime mold. The course is designed to benefit graduate students in biological sciences, as well as mathematics.

MAP 6488—Biomathematics Seminar II (3) *Prereq: MAP 6487.* Continuation of MAP 6487.

MAP 6505—Mathematical Methods of Physics and Engineering I (3) *Prereq: MAA 5404, MAP 5304, 5345, MAS 5157 or equivalent.* Orthogonal functions; theory of distributions; integral equations; eigenfunctions and Green's functions; special functions; boundary and initial value problems, with emphasis on potential theory (Laplace and Poisson equations); the wave equation; and the diffusion equation.

MAP 6506—Mathematical Methods of Physics and Engineering II (3) *Prereq: MAP 6505*

MAP 7436—Seminar in Applied Mathematics I (3; max: 6) Various topics in applications of mathematics both classical and in areas of current research.

MAP 7437—Seminar in Applied Mathematics II (3; max: 6)

MAP 7475—Seminar in Mathematical System Theory (3; max: 18) *Prereq: admission to doctoral study.* Critical review of current developments in system theory, with strong emphasis on (but not limited to) questions of mathematical interest. Presentations by invited speakers as well as by students and faculty affiliated with the Center for Mathematical System Theory. Intensive discussions by participants rather than *ex cathedra* lectures.

MAP 7477—Introduction to Mathematical System Theory I (3; max: 6) *Prereq: consent of instructor. Required for doctoral work in system theory.* Fundamental mathematical structures in the description of dynamical systems, especially linear system and finite automata. Problems of controllability, observability, structure, and identification. Topics to reflect current developments.

MAP 7478—Introduction to Mathematical System Theory II (3; max: 6)

MAS 5157—Vector Analysis (3)

MAS 5311—Introductory Algebra I (3) *Prereq: MAS 4105 or 4302.* The basic algebraic systems: groups, rings, vector spaces, and modules. Linear transformations, matrices, and determinants.

MAS 5312—Introductory Algebra II (3) *Prereq: MAS 5311.*

MAS 6331—Algebra I (3) *Prereq: MAS 5312.* Solvable and nilpotent groups, Jordan-Holder theorem, abelian groups, Galois theory, Noetherian rings, Dedekind domains, Jacobson radical, Jacobson density theorem, Wedderburn-Artin theorem.

MAS 6332—Algebra II (3) *Prereq: MAS 6331.*

MAS 7215—Theory of Numbers I (3) *Prereq: 2 of MAA 6407, 6617, MAS 6332.* Introduction to the theory of numbers; theorems on divisibility; congruences, number-theoretic functions; primitive roots and indices; the quadratic reciprocity law; Diophantine equations and continued functions.

MAS 7216—Theory of Numbers II (3) *Prereq: MAS 7215.*

MAS 7396—Advanced Topics in Algebra I (3; max: 6) *Prereq: MAA 6407, 6617, MAS 6332 or MTG 6347.* Current topics in algebra.

MAS 7397—Advanced Topics in Algebra II (3; max: 6) *Prereq: MAS 7396.*

MAT 6905—Individual Work (3; max: 9)

MAT 6910—Supervised Research (1-5; max: 5) S/U.

MAT 6932—Special Topics in Mathematics (3; max: 9) *Prereq: consent of graduate adviser, who should be consulted well in advance of registration.*

MAT 6971—Research for Master's Thesis (1-15) S/U.

MAT 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.

MAT 7980—Research for Doctoral Dissertation (1-15) S/U.

MHF 5107—Introduction to Set Theory (3) Basic axioms and concepts of set theory, axiom of choice, Zorn's lemma, Schroder-Bernstein theorem, cardinal numbers, ordinal numbers, and the continuum hypothesis.

MHF 5207—Foundations of Mathematics (3) Models and proofs. Foundations of the real and natural number systems. Algorithms. Turing Machines, undecidability and independence. Examples and applications in algebra, analysis, geometry, and topology.

MHF 6306—Mathematical Logic I (3) Languages, models, and theories; Godel's completeness and incompleteness theorems; formal number theory and axiomatic set theory; applications to other areas of mathematics.

MHF 6307—Mathematical Logic II (3) *Prereq: MHF 6306.*

MTG 5316—Introduction to Topology I (3) Basic axioms and concepts of point-set topology, compactness, connectedness, separation axioms, metric spaces, metrization. Tietze extension theorem. Urysohn lemma, Tychonoff theorem, fundamental group.

MTG 5317—Introduction to Topology II (3) *Prereq: MTG 5316.*

MTG 6256—Differential Geometry I (3) *Prereq: MAS 5157 or equivalent.* First part of a two-term sequence. Classical differential geometry of curves and surfaces, differentiable manifolds, tensor analysis, affine connection, Riemannian geometry. Lie groups, Lie algebras, applications to physics.

MTG 6257—Differential Geometry II (3) *Prereq: MTG 6256.*

MTG 6266—Introduction to Commutative Algebra and Algebraic Geometry I (3)

MTG 6267—Introduction to Commutative Algebra and Algebraic Geometry II (3) *Prereq: MTG 6266.*
MTG 6346—Topology I (3) *Prereq: MTG 5317.* A basic introduction to advanced topology. Topics covered include general topology, algebraic topology, homotopy theory and topology of manifolds.
MTG 6347—Topology II (3) *Prereq: MTG 6346.*
MTG 6401—Ergodic Theory and Dynamical Systems I (3) *Prereq: MTG 5317, MAA 6617, or consent of instructor.* Periodic points, recurrence, nonwandering and chain recurrent sets, topological conjugacy, minimal sets. Topological entropy, metric entropy. Measure preserving transformations, ergodicity, mixing. Birkhoff's ergodic theorem. Bernouilli shifts. Anosov diffeomorphisms, structural stability, hyperbolic sets. Basic sets, symbolic dynamics, Markov partitions. Lyapunov exponents, KAM (Kolmogorov, Arnold, Moser) theory.
MTG 6402—Ergodic Theory and Dynamical Systems II (3) *Prereq: MTG 6401.* Continuation of MTG 6401.
MTG 7396—Advanced Topics in Topology I (3; max: 6) *Prereq: MTG 6347.* Topics change yearly.
MTG 7397—Advanced Topics in Topology II (3; max: 6)
MTG 7493—Advanced Topics in Ergodic Theory and Dynamical Systems I (3; max: 6) *Prereq: MTG 6402.* Possible topics: complex dynamics, one-dimensional dynamics, rotation numbers, invariant Cantor sets, twist maps, Lyapunov exponents and Pesin's theory, Hausdorff dimension of attractors, rigidity theory, and Hamiltonian systems.
MTG 7494—Advanced Topics in Ergodic Theory and Dynamical Systems II (3; max: 6) *Prereq: MTG 7493.* Continuation of MTG 7493.

MECHANICAL ENGINEERING
College of Engineering

GRADUATE FACULTY 1993-94

Chairman: W. G. Tiederman. *Graduate Coordinator:* C. K. Hsieh. *Graduate Research Professors:* J. Duffy; A.E.S. Green; J. Tlusty. *Ebaugh Professor:* A. A. Seireg. *Professors:* R. B. Gaither; D. Y. Goswami; C. K. Hsieh; C. C. Oliver; W. M. Phillips; V. P. Roan. *Associate Professors:* C. D. Crane; R. A. Gater; H. A. Ingley, III; G. K. Matthew; C. L. Proctor; J. K. Schueller; S. A. Sherif; K. S. Smith. *Assistant Professors:* E. C. Hansen; J. F. Klausner; W. E. Lear; A. M. Lush; G. J. Micklow; G. J. Miller; J. E. Peterson; C. J. Saltiel; J. C. Ziegert.

Programs are available leading to the degrees of Master of Science, Master of Engineering, Engineer, and Doctor of Philosophy. General areas within which students may specialize are biomechanical systems, energy conversion systems, mechanical systems, thermal systems, manufacturing, and robotics.

Within the specializations noted above are unique opportunities to complete theoretical and experimental research investigations in a wide variety of subspecialities including acoustics, automatic controls, biomechanics, combustion, cryogenics, energy conversion, environmental control, fluid dynamics, gas dynamics, heat transfer, kinematic synthesis, machine dynamics, propulsion, solar energy, thermodynamics, and vibrations.

EML 5104—Classical Thermodynamics (3) Review of the first, second, and third laws. Applications to open and closed systems. Property evaluation using equations of state.
EML 5105—Statistical Thermodynamics (3) Equilibrium distributions in Bose, Fermi, and Boltzmann systems. Property evaluation from microscopic molecular models. Transport properties.
EML 5124—Two-Phase Flow and Boiling Heat Transfer (3)
EML 5131—Combustion I (3) *Prereq: EML 5105 and consent of instructor.* Fundamentals of combustion, reaction kinetics, combustion and detonation phenomena.
EML 5152—Intermediate Heat Transfer (3) Analytical solution of conduction, convention, and radiation problems; exact and approximate solution techniques. Mass transfer in multicomponent fluids.
EML 5223—Design Synthesis in Vibrations (3) Vibration analysis and synthesis of continuous and multidegree of freedom lumped parameter systems. Computational and experimental techniques in modal analysis.
EML 5224—Engineering Acoustics and Noise Control (2) Fundamentals of acoustics; instrumentation for acoustic and vibration measurements; field and laboratory practice; applications to noise control.
EML 5244—Lubrication of Bearings (3) *Prereq: EML 4500 and 4702.* Hydrodynamic, hydrostatic, and squeeze film lubrication fundamentals developed from basic fluid mechanics and applied to typical machine bearings. Design considerations such as load capacity, friction, losses, heat transfer, and bearing materials.
EML 5273—Advanced Dynamics of Machinery (3) *Prereq: EML 3262 or consent of instructor.* Analytic and numeric formulations of geometrically complex machines. Single and multiple degree of freedom systems. Robotic applications.
EML 5311—Control System Theory (3) Analysis of dynamic mechanical engineering control systems. Introduction to classical, digital, and state space techniques. Modeling, stability, transient response, frequency response. Implementation consideration.
EML 5318—Computer Control of Machines and Processes (3) *Prereq: CGS 3463 or permission of instructor.* Basic concepts, including hardware and software. Modeling of machines, processes, and their controllers.
EML 5455—Clean Combustion Technology (2) Latest developments on combustion of pulverized coal, coal water mixtures, natural gas-coal blends, and fluidized bed combustion.
EML 5465—Energy Management for Mechanical Engineers (3) *Prereq: permission of instructor.* Energy use analysis in building envelopes, mechanical systems, and industrial processes. Energy conservation strategies and design techniques. Alternative energy applications.
EML 5504—Mechanical Design I (3) *Prereq: EML 4500.* Problem formulation for design, design criteria, and structuring of appropriate methodologies for developing and comparing problem solutions. Applications covering a broad specturm of mechanical systems.
EML 5505—Mechanical Design II (3) *Prereq: EML 5504.* Case studies and design projects involving the complete design and prototype construction of automatic machinery components and subsystems.
EML 5515—Gas Turbines and Jet Engines (3) *Prereq: EML 4419 or consent of instructor.* Theory and analysis of gas turbine engines and major components.
EML 5516—Design of Thermal Systems (3) *Prereq: EML 4141 and 4702 or equivalent.* Modeling of thermal equipment; system simulation; optimization, search methods, thermal system design and optimization using dynamic, geometric, and linear programming; simulation of large systems, vector and reduced gradient searches.
EML 5595—Mechanics of the Human Locomotor System (2) *Prereq: EGM 3401, 3520.* Study of the human muscolskeletal system from the engineer's perspective. Sensors and actuators in the neuromuscular system; structural elements and bearings in the skeletal system analysis of human activities.
EML 5605—Advanced Refrigeration (3) *Prereq: EML 4601.*
EML 5710—Fundamentals of Computational Fluid Dynamics (3) *Prereq: EML 4141 and 4702.* Fundamentals of finite-difference

methods for obtaining numerical solutions to fluid flow, heat transfer, and combustion problems.

EML 5714—Gas Dynamics of Internal Flow Systems (3) Emphasis on one-dimensional compressible flow.

EML 6103—Advanced Thermodynamics (3) Thermodynamics of nonsimple systems. Multicomponent and multiphase thermodynamic analysis.

EML 6132—Combustion II (3) *Prereq: EML 5131.* Advanced analysis of combustion systems; diagnostic techniques, and numerical procedures for modeling experimental and practical systems.

EML 6154—Conduction Heat Transfer (3) *Prereq: MAP 3302, EML 4141.* Studies of heat conduction in homogeneous, heterogeneous, isotropic, anisotropic, stationary, moving bodies in Cartesian, cylindrical and spherical systems. Both exact and approximate solutions stressed.

EML 6155—Convective Heat Transfer I (3) *Prereq: EML 6716 or equivalent.* Application of the equations of motion to forced and free convection with laminar flow. Solution techniques to include simplification to ordinary differential equations, boundary layer approximations, similarity transformations, and integral approximations. Phenomenological treatment of turbulent transport.

EML 6157—Radiation Heat Transfer (3) *Prereq: MAP 3302, EML 4141.* Theory and analysis for radiation exchange in both transparent and absorbing, emitting and scattering medium.

EML 6159—Special Topics in Heat Transfer (3) *Prereq: EML 4141.*

EML 6267—Structural Dynamics of Production Machinery (3) Review mechanical vibrations with two degrees of freedom. Natural and forced vibrations of multi-degree-of-freedom systems. Experimental and computational modal analysis and synthesis. Vibrations of machine tools, rolling mills, robots.

EML 6274—Dynamic Synthesis of Direct Contact Mechanisms (3) *Prereq: EML 3262.* The design of direct contact mechanisms by classical techniques of rigid body systems and finite differences applied to systems composed of elastic components.

EML 6275—Coplanar Kinematic Synthesis I (3) *Prereq: EML 3262.* Multiply separated position theory for 3, 4, and 5 positions of the moving system. Curvature transformation, circle point curves, and Burmester point theory. Treatment is analytical, with emphasis on the theory of algebraic curves.

EML 6276—Coplanar Kinematic Synthesis II (3) *Prereq: EML 6275.* Application of theory in EML 6275. Point-path, coplanar and function generation synthesis problems for linear, circular, or geared constraints. Reduction of parameters and optimization concepts.

EML 6278—Advanced Rotor Dynamics (3) *Prereq: EML 4220 and consent of instructor.* Analysis of dynamic stability, critical speeds, and unbalance response of rotor-bearing systems. Special problems encountered in modern application operating through and above the critical speeds.

EML 6281—Geometry of Mechanisms and Robots I (3) Development of applications to basic theory of the mathematics required in the design of spatial mechanisms and robot arms. Examples include mathematical description of the elements of mechanisms and robot arms, namely linkages and joints, their mobility and their analysis.

EML 6282—Geometry of Mechanisms and Robots II (3) Theory of screws and application to the determination of stationary and uncertainty configurations of mechanisms and robot arms. Dexterity and workspace of robot arms.

EML 6283—Geometry of Mechanisms and Robots III (3) *Prereq: EML 6282.* Continuation of EML 6282.

EML 6324—Fundamentals of Production Engineering (3) Fundamentals of metal cutting, metal forming, and welding. Accuracy and rigidity of machine tools. Automation, numerical control, adaptive control.

EML 6417—Solar Energy Utilization (3; max: 6) Solar energy; its characteristics and availability; collection and storage; conversion and utilization as heat, refrigeration, thermal electric and power, photovoltaic conversion; and other applications.

EML 6418—Special Topics in Solar Energy (3; max: 9) *Prereq: undergraduate course in thermodynamics and heat transfer.* Selective surfaces, solar collectors, solar thermal power, solar energy storage, direct conversion of solar radiation, solar detoxification; other recent advances.

EML 6451—Energy Conversion (3) Conversion of available forms of energy into mechanical and electrical forms; energy conversion schemes, including conventional cycles in unusual environments. MHD, solar cells, thermionic and photogalvanic conversion and fuel cells.

EML 6506—Sliding-Element Bearing Analysis and Design (3) *Prereq: EML 4702, ENG 3353, or EAS 4106.* Theory and design analysis of hydrodynamic bearings and boundary lubricated sliding bearing.

EML 6507—Rolling-Element Bearing Analysis and Design (3) *Prereq: EML 4500 and 4501 or EGM 5533.* Theory and design analysis of ball bearings and roller bearings.

EML 6508—Computer-Aided Design: Optimization (3) *Prereq: ESI 4312.* Parameter optimization techniques in machine systems.

EML 6597—Mechanics of Gait (3) *Prereq: EML 5595.* Concepts, nomenclature, and control mechanics of normal and pathological bipedal gait.

EML 6606—Advanced Air Conditioning (3) *Prereq: EML 4600.* Air-conditioning system selection and system design; air handling techniques including noise control, cleaning, temperature and humidity control; modern technological development and economic analysis.

EML 6607—Advanced Air Conditioning II (3) *Prereq: EML 6606.* Industrial applications, special requirements for hospitals, survival shelter criteria.

EML 6716—Advanced Fluid Dynamics (3) *Prereq: EML 4702.* Extends the previous fluid flow courses to include a wider range of subject material and provide a background for convection heat transfer courses.

EML 6717—Thermodynamics of Fluid Flow I (3) *Prereq: EML 4702.* Compressible flow; emphasis on two-dimensional flow in internal flow systems.

EML 6718—Thermodynamics of Fluid Flow II (3) *Prereq: EML 6717.* Continuation of EML 6717. Emphasis on axisymmetric, unsteady, and hypersonic flow.

EML 6726—Advanced Computational Fluid Dynamics (3) *Prereq: EML 5710 and 6716.* Application of finite-difference methods to the study of steady and unsteady multidimensional flows, including compressible and incompressible, laminar and turbulent, reacting and nonreacting, viscous and inviscid.

EML 6729—Topics in Fluid Dynamics (3) *Prereq: EML 4702.*

EML 6905—Individual Projects in Mechanical Engineering (1-3; max: 12)

EML 6910—Supervised Research (1-3; max: 5) S/U.

EML 6911—Mechanical Research (1-3; max: 6) Research projects in mechanical engineering.

EML 6934—Special Topics in Mechanical Engineering (1-4; max: 9)

EML 6936—Nonthesis Project (1-4; max: 6) An in-depth project for graduate students not pursuing a thesis master's degree. S/U.

EML 6940—Supervised Teaching (1-5; max: 5) S/U.

EML 6971—Research for Master's Thesis (1-15) S/U.

EML 6972—Research for Engineer's Thesis (1-15) S/U.

EML 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.

EML 7980—Research for Doctoral Dissertation (1-15) S/U.

MEDICAL SCIENCES—GENERAL
College of Medicine

The College of Medicine offers programs leading to the Doctor of Philosophy and Master of Science degrees in medical sciences, with specialization in anatomy and cell biology, immunology and medical microbiology, neuroscience, oral biology, pathology, pharmacology and therapeutics, and physiology. The Department of Biochemistry and Molecular Biology offers separate Ph.D and M.S. programs. Training in these scientific disciplines is planned to prepare the student for a career in research and teaching, rather than in clinical practice for which the Doctor of Medicine degree program is designed.

The graduate faculty and the courses offered are listed under department headings in this *Catalog*. A minor is not required but may be chosen in another of the basic sciences listed below or elsewhere in the *Catalog*. All facilities of the College of Medicine are available to graduate students in this program. Though an undergraduate major in biological or physical science is desirable, concentration in mathematics or engineering is an appropriate foundation for the Ph.D. in medical sciences. Satisfactory completion of a thesis based on research is a requirement for a graduate degree in the medical sciences (see *College of Medicine Catalog*).

The interdisciplinary study in toxicology is coordinated by the Center for Environmental and Human Toxicology and is concerned with the effect of chemicals on human and animal health. Center-affiliated faculty is composed of approximately 20 to 30 scientists and clinicians interested in elucidating the mechanism of chemical induced toxicity and is drawn from the Colleges of Medicine, Veterinary Medicine, Pharmacy, and Engineering, and the Institute of Food and Agricultural Sciences. The broadly based, interdisciplinary expertise provided by this faculty is also used to address complex issues related to the protection of public health and the environment. Additional information may be obtained from the codirector, Dr. Kathleen Shiverick, P. O. Box 100267, HSC, or (904) 392-3545.

An interdisciplinary emphasis in vision sciences is available. The Department of Ophthalmology serves as the administrative and logistical center. However, most faculty members are from the basic science departments—Anatomy and Cell Biology, Biochemistry and Molecular Biology, Immunology and Medical Microbiology, Neuroscience, Pathology and Laboratory Medicine, and Pharmacology and Therapeutics. Current interests include study of the regulation of gene expression in the mammalian retina and lens, especially during fetal development, biochemistry of vision in vertebrates and invertebrates, biochemistry and neurobiology of wound healing and neural tissue regeneration, and molecular and cell biology of animal model of retinal degeneration. Further information may be obtained from the program director, Dr. William W. Hauswirth, P. O. Box 100266, HSC, (904) 392-0679.

In addition, the College of Medicine offers a Medical Scientist Training Program (combined M.D.-Ph.D. degree) to highly qualified students. Candidates for this five-to-seven year program must satisfy admission requirements of both the College of Medicine and the Graduate School. Applicants should specify the basic science department to which admission is sought; they will be admitted following independent approval by the Medical Admissions Committee, the department graduate selection committee, and a Medical Scientist Training Program Board. Applications are coordinated through the Office of the Dean of the College of Medicine. Study and dissertation research in departments other than basic science departments in the College of Medicine may be included in this program.

GMS 6901—Seminar in Biology of Disease (1; max: 8) Current advances in etiology and treatment of disease. S/U.
GMS 6905—Research in Medical Sciences (1-10; max: 10) Supervised research other than that for the thesis or dissertation in anatomy and cell biology, biochemistry and molecular biology, immunology and medical microbiology, neuroscience, oral biology, pathology and laboratory medicine, physiology, and pharmacology and therapeutics.
GMS 6910—Supervised Research (1-5; max: 5) S/U.
GMS 6940—Supervised Teaching (1-5; max: 5) S/U.
GMS 6971—Research for Master's Thesis (1-15) S/U.
GMS 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.
GMS 7980—Research for Doctoral Dissertation (1-15) S/U.

MEDICINAL CHEMISTRY
College of Pharmacy

GRADUATE FACULTY 1993-94

Interim Chairman: M. O. James. *Graduate Coordinator:* R. J. Bergeron. *Graduate Research Professor:* R. J. Bergeron. *Professors:* M. O. James; J. H. Perrin; K. V. Rao; S. G. Schulman; R. Streiff. *Associate Professor:* K. B. Sloan.

The College of Pharmacy offers the Doctor of Philosophy and the Master of Science in Pharmacy degrees in pharmaceutical sciences with specialization in medicinal chemistry.

Specific areas include research in drug metabolism, prodrugs, soft drugs, natural product chemistry, enzyme-substrate binding mechanisms, design and synthesis of medicinal agents, multiple pulse NMR techniques, effects of high pressure on biological membranes, site specific delivery of drugs, target organ toxicity, metal chelate design, drug analysis, and drug-protein interaction.

The applicant should have an undergraduate degree in pharmacy, chemistry, biology, or premedical sciences. A background in calculus and physical and organic chemistry is required.

In addition to graduate medicinal chemistry courses in the College of Pharmacy, graduate courses in chemistry and biochemistry are required for the program.

The Department also participates in the interdisciplinary specialization in toxicology. For more information, see the *Interdisciplinary Graduate Studies* section of this *Catalog*.

PHA 5359—Cancer Chemotherapy (2) *Prereq: BCH 4024.* The chemotherapeutic agents which are currently in clinical use or under trial are classified according to their general mode action and are presented with their relevant chemical, pharmaceutical, and biological characteristics.
PHA 5437—Medicinal Chemistry I: Natural Products (4) Isolation, structure, and pharmaceutical applications of natural products used as prescription and nonprescription drugs, with emphasis on structure-activity relationships.
PHA 5438—Medicinal Chemistry II (3) Relationship of physical and chemical factors to drug activity of inorganic and organic medicinal compounds.
PHA 5439—Medicinal Chemistry III (3) Relationship of physical and chemical factors to drug activity of inorganic and organic medicinal compounds. Examination of structure/activity relationships, toxicity, and metabolism of medicinal compounds.
PHA 5475—Synthesis of Prodrugs (3) *Prereq: introductory organic chemistry, medicinal chemistry, pharmaceutics.* An outline of synthetic and physical chemical approaches to solving drug delivery, bioavailability, activity, potency, toxicity, and acceptability problems.
PHA 6115—Equilibria, Complexations, and Interactions of Drugs (3) Models for drug interactions in solution. Physical chemistry characteristics of drugs and their complexes in pharmaceutical systems.
PHA 6354—Natural Medicinal Products I (3) Chemistry of compounds derived from plants and animals.
PHA 6354L—Natural Medicinal Products I (2) Accompanying laboratory course for PHA 6354. Isolation and identification of plant and animal products.
PHA 6355—Natural Medicinal Products II (3) *Prereq: PHA 6354.*
PHA 6355L—Natural Medicinal Products II (2) Accompanying laboratory course for PHA 6355. Isolation and identification of plant and animal products.
PHA 6417—Pharmaceutical Analysis II (3)

PHA 6425—Drug Metabolism and Toxicity (3) *Prereq: introductory organic chemistry, biochemistry.* Enzymology and mechanisms of drug metabolism. Examples of where metabolism leads to toxicity.
PHA 6445—Drug Design (3) Aspects of medicinal chemistry.
PHA 6470—Synthetic Medicinal Products I (2) The application of modern synthetic organic chemistry to the synthesis of medicinals.
PHA 6471L—Synthetic Medicinal Products (3)
PHA 6905C Research Procedures in Medicinal Chemistry (1-4; max: 12)
PHA 6934—Seminar in Medicinal Chemistry (1; max: 3) Weekly presentation and discussion of research reports based on college programs or literature. S/U option.

MICROBIOLOGY AND CELL SCIENCE
College of Agriculture

GRADUATE FACULTY 1993-94

Chairman: E. M. Hoffmann. *Graduate Coordinator:* K. T. Shanmugam. *Graduate Research Professors:* H. M. Johnson; R. R. Schmidt. *Professors:* P. M. Achey; H. C. Aldrich; J. E. Gander; E. M. Hoffmann; D. H. Hubbell; L. O. Ingram; R. A. Jensen; J. F. Preston, III; K. T. Shanmugam; P. H. Smith *(Emeritus). Associate Professors:* F. C. Davis, Jr.; D. E. Duggan; S. R. Farrah; W. B. Gurley; E. P. Previc; M. L. Tamplin; S. G. Zam. *Assistant Professor:* S. E. Coleman.

Graduate study is offered leading to the Master of Science and Doctor of Philosophy degrees in microbiology and cell science, with emphasis in one or more of the disciplines of biochemistry, cell biology, and microbiology. Instruction and guidance are collaborative among faculty in the Colleges of Agriculture, Liberal Arts and Sciences, and Medicine.

Areas of research include anaerobic metabolism; biomass conversion; nitrogen fixation; membrane and cell wall chemistry and biochemistry; immunology; virology; microbial ecology; bacterial and phage genetics; DNA, RNA, and protein synthesis; molecular aspects of development of procaryotic and eucaryotic systems; cell ultrastructure.

Prerequisites for admission to graduate study, in addition to those of the Graduate School, are a broad educational background including mathematics, physics, and chemistry through organic, analytical, and physical chemistry; basic courses in botany and zoology; and preferably at least one course in microbiology and biochemistry. An undergraduate major in physical or chemical science, engineering, or general biology is usually acceptable. Receipt of an advanced degree requires detailed knowledge in microbiology, biochemistry, and chemistry; undergraduate deficiencies may necessitate additional course work prior to entry into the graduate program.

In addition to the courses listed below, the following will be accepted for credits toward graduate degrees in microbiology and cell science: BCH 6206, 6415, 6740, and GMS 6152.

MCB 5458—Energy Transformation in Microorganisms (3) *Prereq: MCB 3020C and CHM 4025 or BCH 4024.* Energy transformations of dissimilatory and assimilatory processes in microorganisms with emphasis on regulation and energy cycles. Applications to microbial energy transformations to low energy technology.
MCB 6127—The Literature of Microbiology (2) *Prereq: eight credits of microbiology.* Bibliographic method in searching the literature. Literature of specific areas of the discipline.
MCB 6315—Recombinant DNA Techniques (2) *Prereq: BCH 6415 and/or GMS 6152 and consent of instructor.* Application of recombinant DNA techniques, agarose gel electrophoresis and hybridization for the *in vitro* construction, selection, and characterization of chimeric *E. coli* vector plasmids.
MCB 6409—Microbial Cell Structure and Function (3) *Prereq: undergraduate biochemistry and microbiology and consent of instructor.* Review of current knowledge concerning structure, function, and biosynthesis of microbial cells.
MCB 6415—Comparative Biochemistry and Physiology of Anaerobic Bacteria (2) *Prereq: undergraduate biochemistry and microbiology and consent of instructor.* Biochemical principles which govern energy flow through anaerobic food chains. Rumen discussed as a model system. Emphasis on selected microbial species and details of metabolism influencing, microbial interaction, nutrition, substrate dynamics, HB flow, methanogenesis.
MCB 6416—Nitrogen Metabolism in Plants and Microorganisms (2) *Prereq: consent of instructor.* Biochemistry, molecular genetics, and regulation of inorganic nitrogen assimilation and other aspects of nitrogen metabolism unique to bacteria, fungi, yeasts, algae, and higher plants. Offered spring semester in even-numbered years.
MCB 6435—Molecular Radiation Biology (2) *Prereq: undergraduate courses in biology, chemistry, and physics, and consent of instructor.* A survey of the effects of ionizing and nonionizing radiation, with emphasis on cellular and molecular mechanisms.
MCB 6456—Transcriptional Regulation (2) *Prereq: BCH 6415 or BMS 6352C and consent of instructor.* Mechanisms regulating specific transcription in procaryotes and eucaryotes examined at the DNA and enzyme level.
MCB 64B5—Advanced Techniques in Microbiology and Cell Science (2-4; max: 4) *Prereq: consent of instructor.* Application of advanced techniques to experimental research in biochemistry, cell biology, and microbiology.
MCB 6905—Experimental Microbiology (1-8; max: 12) *Prereq: eight credits in microbiology and cell science.* Application of physical, chemical and biological techniques to experimental problems in microbiology. Individual laboratory study. H.
MCB 6910—Supervised Research (1-5; max: 5) S/U.
MCB 6930—Seminar (1; max: 8) Attendance required of all graduate majors at all research presentations. S/U.
MCB 6937—Special Topics in Microbiology (1-4; max: 12) Contemporary research in a particular aspect of general microbiology.
MCB 6940—Supervised Teaching (1-5; max: 5) S/U.
MCB 6971—Research for Master's Thesis (1-15) S/U.
MCB 7914—Research Conference (1; max: 8) Critical discussion and appraisal of research programs of faculty and students. S/U.
MCB 7922—Journal Colloquy (1; max: 8) Critical presentation and discussion of recent original articles in the microbiological literature. Attendance required.
MCB 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U
MCB 7980—Research for Doctoral Dissertation (1-15) S/U.
PCB 5136L—Techniques in Microbial and Cell Biology (3) *Prereq: MCB 3020C, CHM 3120, 3120L.* A laboratory in experimental bacteriology and cell biology. Emphasis on experimental approaches and techniques used in study of cells and microorganisms. Experiments in microscopy, cell fractionation, metabolism, physiology, genetics, and regulation.
PCB 5235—Immunology (3) *Prereq: MCB 3020C or introductory microbiology course which includes introductory immunology.*

Immune system of vertebrate animals. The cellular and molecular events involved in immune responsiveness and resistance to infectious diseases.

PCB 5235L—Experiments in Immunology (1) *Prereq: MCB 3020C; coreq: PCB 5235.* Basic seriological procedures in immunology.

PCB 6176—Electron Microscopy of Biological Materials (2) *Prereq: MCB 3020C or equivalent; graduate student standing.* Use of the electron microscope including fixation, embedding, sectioning, freeze-etching, negative staining, and use of vacuum evaporator.

PCB 6176L—Laboratory in Electron Microscopy (2) *Prereq: consent of instructor; coreq: PCB 6176.* Training in use of electron microscopes, ultramicrotomes, vacuum evaporators, and freeze-etch machines.

PCB 6216C—Cytochemistry (3) *Prereq: PCB 6176L.* Cellular organization, cell function, and cytochemical technique. Offered in odd-numbered years.

BMS 6203—Cell Membranes: Molecular Biology and Function(2) *Prereq: BCH 4024, and MCB 3020C or equivalent, and consent of instructor.* Composition, molecular organization, and function of biological membranes in both eucaryotes and procaryotes.

BOT 6256C—Plant Cytology (3) Fundamental structures of eucaryotic and procaryotic cells, with emphasis on higher plants cells, algae, and cyanobacteria. Offered in even-numbered years.

MUSIC
College of Fine Arts

GRADUATE FACULTY 1993-94

Chair: G. Oliva. *Assistant Chair:* P. E. Dorman. *Graduate Program Advisors:* W. R. Bodine, Jr. (Performance); C. R. Hoffer (Music Education); D. Z. Kushner (Music History and Literature); B. A. Udell (Theory and Composition). *Professors:* W. R. Bodine, Jr.; P. E. Korman; S. B. Fouse; E. P. Graham; C. R. Hoffer; J. S. Kitt-Turner; S. P. Kniseley; D. Z. Kushner; G. Oliva; A. C. Penland, Jr.; R. Poole *(Emeritus);* B. Sharon; B. A. Udell; D. A. Waybright; J. D. White. *Associate Professors:* A. C. Jennings; R. L. Robinson; C. M. Smith. *Assistant Professors:* K. L. Brooks; L. N. Crook; J. F. Davis; H. Hughes; K. Sharpe.

The Department of Music offers programs leading to the Master of Music degree in music and music education. Program emphases in music include music performance, theory, composition, music history and literature, sacred music, organ pedagogy, piano pedagogy, voice pedagogy, accompanying, choral conducting, instrumental conducting, string pedagogy, and string development.

In addition, the Department of Music offers the Doctor of Philosophy in music education with areas of emphasis in (1) music education; (2) music history and literature; and (3) music theory. Program emphasis is on the college teaching of music; consequently, all students are required to take an 18-credit-hour music education core which includes MUE 6080—Foundations of Music Education; MUE 6385—Music in Higher Education; MUE 7685—Foundations of Musical Behavior; MUS 6940—Supervised Teaching; and two courses at the 6000/7000 level in specialization. They must be under the supervision of their supervisory chairs. Students will be encouraged to find other opportunities to teach and lecture in their specializations, and with the assistance of their principal professors, to prepare papers, workshops, and clinics for presentation at professional conferences, in the public schools, and at colleges and universities. Students will, in addition, be encouraged to publish their research in appropriate journals.

During the week of the student's first registration, he/she must take placement examinations in music performance, in music history and literature, in music theory, and in music education. Music education students must satisfy requirements for music teaching certification in Florida before the appropriate degree is awarded. Voice students must demonstrate appropriate skills in language and diction. All deficiencies must be remedied.

MUC 6444—Composition of Electronic Music (3) *Prereq: MUC 4301.*

MUC 6930—Seminar in Composition (3; max: 6) Composition of chamber works for instrumental and/or vocal ensembles.

MUC 7931—Advanced Seminar in Composition (3; max: 6) Composition for large instrumental and/or vocal ensembles.

MUE 6080—Foundations of Music Education (3) Historical development and philosophy; comparison of United States with other countries and cultures; individuals, associations and institutions that shape the music education program.

MUE 6218—Early Childhood Music Education (3) Designing musical environments, planning and implementing music instruction, and reviewing and evaluating research and teaching materials.

MUE 6349—Music in the School (1-6; max: 6) Offered by extension only. In-service training for teachers.

MUE 6385—Music in Higher Education (3) Various aspects and programs of music in higher education for persons who intend to teach in or administer departments of music.

MUE 6444—Materials and Methods of String Class Teaching (2) Survey of materials and methods suitable for public school string classes and orchestras.

MUE 6497—Public School Orchestral Literature (2) Survey of materials suitable for various educational levels.

MUE 6647—Trends in Teaching and Learning Music (3)

MUE 6785—Methods of Research in Music Education (3) Materials and specialized techniques of research in music education.

MUE 6931—Contemporary Curriculum Practices in Music Education (3) An exploration of the ways in which artistic forms of understanding and reflection can be useful in designing and evaluating education programs.

MUE 7746—Measurement and Evaluation of Music (3) *Prereq: MUE 7685.* Examination of methods and techniques for measuring and evaluating learning in music.

MUE 7846—Philosophies of Music Education (3) The nature and meaning of the aesthetic experience as it relates to music education.

MUE 7938—Music Education Seminar (3) Contemporary issues and problems in music education and the investigation and planning of research relevant to selected problems.

MUG 6105—Graduate Conducting (3; max: 15) Conducting larger works from the standard repertoire for band, orchestra, and chorus.

MUG 7106—Advanced Graduate Conducting (3; max: 15) *Prereq: MUG 6105.* For conducting emphasis. Conducting major works for band, orchestra, and chorus, with emphasis on analysis and interpretation.

MUH 5219—Graduate Music History Review (3)

MUH 5505—Introduction to Ethnomusicology (3) *Prereq: permission of instructor.* Field research, use of oral, written, and media sources, transcription and analysis, and interpretative techniques.

MUH 6635—Seminar in American Music (3) History and literature of American music from the landing of the pilgrims to the present.

MUH 6660—History of Opera (3) The historical development of opera and its literature from the Florentine Camerata to the present.

MUH 6671—Seminar in Renaissance Music (3) Selected topics from the Renaissance era for research and study.

MUH 6672—Seminar in Baroque Music (3) Selected topics from the Baroque era for research and study.
MUH 6673—Seminar in Classical Music (3) Selected topics from the Classical era for research and study.
MUH 6674—Seminar in Romantic Music (3) Selected topics from the Romantic era for research and study.
MUH 6675—Seminar in Twentieth-Century Music (3) Selected topics from the twentieth century for research and study.
MUH 6931—Nationalism in Music (3) The historical development of nationalistic movements in music with emphasis on the nineteenth and twentieth centuries.
MUH 7411—Medieval and Renaissance Notation (3) Study of Medieval and Renaissance notational practices, with practical experience in transcriptions of lute and organ tablatures.
MUH 7938—Musicology Seminar (3; max: 9) *Prereq: MUS 6716.* Contemporary issues and problems in musicology, and the investigation and planning of research relevant to selected problems.
MUL 5624—German Vocal Literature (3) Study and class performance of German song literature of the nineteenth and twentieth centuries.
MUL 5625—French Vocal Literature (3) Study and class performance of French song literature in the nineteenth and twentieth centuries.
MUL 6435—String Literature (3) Survey of solo study materials suitable for preparatory departments affiliated with conservatories and universities.
MUL 6486—Piano Literature (3) Survey of piano literature from the Baroque era to the present.
MUL 6505—Symphonic Literature (3) Survey of orchestral music from the Baroque era to the present.
MUL 6565—Chamber Music Literature (3) Survey of music literature for chamber ensemble from the Baroque era to the present.
MUL 6645—Choral Literature (3) Survey of choral music literature from the Renaissance era to the present.
MUN 6020—Graduate Ensemble (1; max: 3) For graduate students holding positions of leadership and participating in music ensembles.
MUN 6515—Studio Accompanying (2; max: 6)
MUR 6206—Survey of Hymnody (3) The historical development of hymns in liturgical use, the scope of hymnic literature, and the major trends in hymnal compilation and editing.
MUR 6705—Sacred Music Literature (3) Development of congregational and choral song from the early church to the present; survey of instrumental forms in worship music.
MUS 5665—Music Criticism (3) History and literature of music criticism. Practical experience in writing reviews of musical compositions and of live and recorded performances.
MUS 6685—Foundations of Musical Behavior (3) Cultural influences, learning conditions, biological constraints, psychoacoustical phenomena, musical taste, the measurement and prediction of musical taste, the measurement and prediction of musical ability.
MUS 6716—Methods of Musical Research and Bibliography (3) Materials and specialized techniques of research in musicology.
MUS 6905—Projects and Problems in Music (3; max: 12 including MUS 7905) Approved problems for study and research.
MUS 6910—Supervised Research (1-5; max: 5) S/U.
MUS 6940—Supervised Teaching (1-5; max: 5) S/U.
MUS 6971—Research for Master's Thesis (1-15) S/U.
MUS 6973—Individual Project (1-10; max: 10) Creative project or graduate recital in lieu of written thesis. Project or recital must be acceptable to candidate's supervisory committee and to the Graduate School. S/U.
MUS 7905—Projects and Problems in Music (3; max: 12 including MUS 6905) For doctoral students. Approved problems for study and research.
MUS 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.
MUS 7980—Research for Doctoral Dissertation (1-15) S/U.
MUT 6051—Graduate Music Theory Review (3)
MUT 6445—Advanced Counterpoint (3) *Prereq: MUT 4411, 4421.* Emphasis on advanced harmonic techniques and upon fugal writing.
MUT 6531—Figured Bass and Continuo Performance (3) Theoretical principles and practical application of figured bass realization and continuo performance practice techniques.
MUT 6565—Late Nineteenth- and Twentieth-Century Styles (3) *Prereq: MUT 3611.* Analysis of exemplary works of the late nineteenth and twentieth centuries.
MUT 6624—Seminar in Set Theoretical Analysis (3) *Prereq: MUT 6629 and doctoral standing in music theory.* Advanced study in set theory for the analysis of music including Howard Hanson's approach and the numerical system that evolved from it.
MUT 6627—Seminar in Schenkerian Analysis (3) *Prereq: MUT 6629 and doctoral standing in music theory.* Advanced study of Heinrich Schenkler's reductive approach to analysis of music.
MUT 6629—Analytical Techniques (3) Study of analytical systems and methodology emphasizing style analysis and the integration of all elements of music.
MUT 6751—Pedagogy of Music Theory (3)
MUT 7316—Advanced Orchestration (3) Analysis of nineteenth- and twentieth-century compositions for full orchestra and orchestration of original scores and arrangements for full orchestra.
MUT 7585—Seminar in Musical Style (3) Analysis of exemplary works from the Medieval period to the early nineteenth century.
MUT 7760—History of Music Theory (3) The study of musical theories, primarily through readings, from ancient Greece to the present.
MVK 6550—Repertory Keyboard Chamber Music (3; max: 6) Performance of major works from chamber music repertory.
MVK 6605—Organ Pedagogy (3) Introduction to teaching basic organ performance techniques, posture, and approaches to practice.
MVK 6606—Advanced Organ Pedagogy (3) Literature and practice techniques for the intermediate and advanced organ student; approaches to contemporary and avant-garde compositions.
MVK 6651—Piano Pedagogy (3) Introduction to the teaching of basic piano performance and literature.
MVK 6661—Advanced Piano Pedagogy (3) Teaching materials for the intermediate and advanced student; methodologies of piano technique.
MVK 6705—Seminar in Vocal Accompanying (2; max: 4) Performance of major works for voice and piano.
MVO 6250—Secondary Music Performance (3; max: 15) Offered in piano, voice, organ, harpsichord, historical instruments, conducting, carillon, and all standard band and orchestral instruments.
MVO 6460—Music Performance (4; max: 8) Offered in piano, voice, organ, harpsichord, historical instruments, conducting, carillon, and all standard band and orchestral instruments.
MVO 7260—Secondary Music Performance (3; max: 15) For doctoral students. Offered in piano, voice, organ, harpsichord, historical instruments, conducting, carillon, and all standard band and orchestral instruments.
MVO 7460—Music Performance (4; max: 16) For doctoral students. Offered in piano, voice, organ, harpsichord, historical instruments, conducting, carillon, and all standard band and orchestral instruments.
MVS 6651—String Pedagogy I (3) Survey of Suzuki violin pedagogy from Unit IA (Pre-Twinkle) through Unit IV (Vivaldi A Minor Concertos).
MVS 6652—String Pedagogy II (3) *Prereq: MVS 6651.* Survey of Suzuki violin pedagogy from Unit V (Bach Double Concerto) through Unit VIII (Mozart Violin Concerto).
MVV 6651—Vocal Pedagogy (3) *Prereq: SPA 3101 or equivalent.* Study and teaching of vocal techniques.

MVV 6661—Advanced Vocal Pedagogy (3) *Prereq: SPA 3101 or equivalent.* In-depth study of teaching of vocal techniques to singers of all ages.

NEUROSCIENCE
College of Medicine

GRADUATE FACULTY 1993-94

Chairman: W. G. Luttge. *Graduate Coordinator:* L. A. Ritz. *C. M. and K. E. Overstreet Professor of Neuroscience and Neurological Surgery:* D. K. Anderson. *Mark F. Overstreet Professor of Neurological Surgery and Neuroscience:* P. J. Reier. *Professors:* B. W. Ache; W. W. Dawson; M. B. Heaton; S. P. Kalra; C. M. Leonard; W. G. Luttge; J. B. Munson; C. VanHartesveldt; C. J. Vierck, Jr.; D. W. Walker. *Scientist:* G. S. Bennett. *Associate Professors:* P. A. V. Anderson; B. A. Battelle; B. E. Hunter; J. C. Middlebrooks; R. L. Reep; L. A. Ritz; G. P. Shaw; D. J. Stehouwer; C. Sumners; F. J. Thompson; J. E. Zengel. *Assistant Professors:* K. J. Anderson; B. Y. Cooper; J. G. Flannery; M. A. King; A. J. MacLennan; S. Semple-Rowland; W. J. Streit; T. W. Vickroy.

The Department of Neuroscience offers specialization leading to the Doctor of Philosophy degree in medical sciences, and in special cases, the Master of Science degree. All students receive training in neuroanatomy, developmental and recovery of function neurobiology, behavioral neurobiology, cellular neurophysiology, sensory and motor neurobiology, molecular and cellular neurochemistry, neuroendocrinology and neuropharmacology.

Prospective students should have sound preparation in biology, chemistry, mathematics, physics, and behavioral sciences. An important consideration, however, is a demonstration of high motivation and a serious intention to pursue a research career in the neurosciences. Prior laboratory experience is regarded favorably. Only students with strong undergraduate credentials and high GRE scores are considered for admission.

BMS 6510—Neurophysiology (4) Cellular and membrane bases of electrical potentials, energy transduction, and information transfer in neurons, glia, and special sense organs.

GMS 6703—Pain and Somesthesis (3) Current research on central nervous system coding and information, using somesthesis as a model, with particular emphasis on pain.

GMS 6735—Neuropharmacology (3) *Prereq: background in biochemistry and basic neuroscience or consent of instructor.* The identification, synthesis, metabolism, and pharmacology of neurotransmitters and their receptors, to include biogenic amines, neuropeptides, and other nervous system transmitters.

GMS 7706C—Medical Neuroscience (4) Comprehensive overview of human neuroanatomy from the subcellular to the gross tissue level. Lectures cover neurochemistry, neuropharmacology, neurophysiology, neuroendocrinology, and neurobehavioral biology. Clinical correlation and applications. H. S/U option available for nonmedical sciences majors.

GMS 7720—Motor Systems (3) Discussion to focus on the segmental and suprasegmental regulation of motor activity in the normal spinal cord, how these mechanisms are affected by spinal cord trauma, and the hypothetical framework for seeking ways to restore or improve motor function in the injured spinal cord. Emphasis to be given from a combined anatomical and physiological perspective to topics such as muscle spindle system, spasticity, midbrain and spinal pattern generators, recovery of locomotion in lower vertebrates, neuroplasticity, cell biology of axonal regeneration, and neural tissue transplantation.

GMS 7731—Molecular Neurobiology (4) *Prereq: biochemistry.* Introduction and overview of modern neurochemistry, including a brief introduction of neuroendocrinology and neuropharmacology. Neural cell biology and metabolism will be discussed with emphasis on the relationships of molecular mechanisms to neural function.

GMS 7733—Cellular and Molecular Neurobiology (4) Cellular and subcellular structure of nervous tissue. Nervous system biochemistry including metabolism and function of neurotransmitters. Axoplasmic transport. Degeneration and regeneration and trophic functions of nervous tissue.

GMS 7742—Research Methods in Neuroscience (1-7; max: 12) Research techniques in experimental neuroscience.

GMS 7743—Developmental Neurobiology (3) Seminar on the neuroanatomical and functional development of the nervous system. Discussion of mechanisms of embryonic neurogenesis, behavioral embryology, and current research in neuroembryology.

GMS 7750—Comparative Neuroanatomy (2-3; max: 3) Lecture and laboratory course concerning general principles of vertebrate neuroanatomy and brain and spinal cord organization. Mammalian neuroanatomy stressed.

GMS 7760—Systems Neurobiology (4-6; max: 6) Lecture course concerned with the neurobiology of vision, somesthesis and audition.

GMS 7794—Neuroscience Seminar (1; max: 12) Readings and discussions of current topics in neuroscience. S/U.

GMS 7795—Special Topics in Neuroscience (1-4; max: 12) Intensive readings and lectures in specialized fields of neuroscience and allied disciplines.

GMS 7798—Recent Advances in Neuroscience (1-2; max: 16) Seminar and group discussions of recent advances in one or more areas of neuroscience. S/U option.

NUCLEAR ENGINEERING SCIENCES
College of Engineering

GRADUATE FACULTY 1993-94

Chairman: J. S. Tulenko. *Graduate Coordinators:* A. S. Anghaie; L. F. Brateman; A. M. Jacobs; D. E. Hintenlang. *Graduate Research Professor:* A. E. S. Green. *Professors:* S. Anghaie; G. R. Dalton; N. J. Diaz; A. M. Jacobs; W. Mauderli; M. J. Ohanian; C. E. Roessler *(Emeritus)*; G. J. Schoessow *(Emeritus)*; K. N. Scott; E. V. Staab, Jr.; J. S. Tulenko; H. A. Van Rinsvelt. *Associate Professors:* F. J. Bova; L. F. Brateman; E. T. Dugan; W. H. Ellis *(Emeritus)*; L. T. Fitzgerald; W. S. Properzio; G. S. Roessler *(Emeritus)*. *Associate Engineer:* W. G. Vernetson. *Assistant Professor:* D. E. Hintenlang.

The Department offers the degrees of Master of Science, Master of Engineering, Engineer, and Doctor of Philosophy in nuclear engineering sciences with emphasis in nuclear power engineering, health physics, medical physics, and engineering physics. The medical physics and health physics options are offered through interdepartmental programs in cooperation with the College of Medicine and the Department of Environmental Engineering Sciences (see the *Health Physics and Medical Physics* description under *Interdisciplinary Graduate Studies*).

The Department also offers a combined B.S.N.E./M.S. degree program. This program allows qualified students to

earn both a bachelor's degree and a master's degree with a savings of one semester. Qualified students may begin their master's program while seniors and count 12 hours of specified nuclear engineering sciences graduate courses for both the bachelor's and master's degree requirements. Seniors admitted to the combined program are eligible for teaching and research assistantships. Program admission requirements are (1) satisfaction of Graduate School admission requirements for a master's degree, (2) an upper-division (undergraduate) GPA of at least 3.6, and (3) completion of specified bachelor's degree requirements.

Specific areas of emphasis include advanced and space nuclear power concept and systems, space nuclear propulsion, nuclear reactor power plant technology and operations, reactor dynamics and control, environmental aspects of nuclear power generation, mobile robotics for hazardous environments, nuclear waste management, reactor physics, nondestructive evaluation of structures and materials, radiographic imaging technique development, nuclear detection and instrumentation, bionucleonics, radiation dosimetry, medical diagnostic imaging, medical radiation physics, radiation biology, and health physics.

The requirement for admission to the graduate program in nuclear engineering sciences is a bachelor's degree in an approved program in engineering or in the sciences. If the student's background is considered deficient for the planned course of study, an articulation program of background courses will be required.

Depending on professional objectives, the student may omit the master's thesis and substitute eight credits of graduate-level course work, of which at least six credits are in nuclear engineering sciences, including a four-credit (minimum) special project (ENU 6936). In such cases the completion of 32 credits will meet the minimum requirements for the nonthesis degree.

It normally requires 12 months to complete the requirements for a master's degree. Students in the medical physics option usually take 21 to 24 months to complete the master's degree. If articulation work is required, it may take longer, depending upon the extent of the student's deficiency.

In addition to graduate courses in nuclear engineering, the following courses are acceptable for in-department graduate credit as part of the health physics option: ENV 6215—Health Physics; ENV 6215L—Health Physics Laboratory; ENV 6216—Radioactive Wastes; ENV 6236—Radiological Techniques: ENV 6932—Special Problems in Environmental Engineering; and STA 6166—Statistical Methods in Research. The medical physics option includes the following courses for in-department graduate credit: ENV6215—Health Physics and STA 6166—Statisical Methods in Research.

EML 5124—Two-Phase Flow and Boiling Heat Transfer (3) *Prereq: introductory level fluid mechanics and heat transfer.* Basic principles, mathematical modeling and applications of two-phase flow, boiling heat transfer, and evaporation and condensation.

ENU 5005—Fundamentals of Reactor Engineering (3) Fundamentals of reactor physics and power generation in nuclear reactors. Introduction to LWR systems, fuel, instrumentation, operation, licensing and safety.

ENU 5142—Reliability and Risk Analysis for Nuclear Facilities (3) *Prereq: ENU 4144 or 5005 and 4934 or 6935.* Nuclear facilities' safety systems including reliability and probabilistic risk assessment.

ENU 5143—Chemical Technology of Power Reactors (2) *Prereq: course in reactor physics.* Water coolant technology applied to nuclear power plants. Presents the supporting scientific and engineering information to understand the current literature and operating practice in the field.

ENU 5146—Fundamentals of Reactor Safety; Operational Transients and Accident Analysis (3) *Prereq: ENU 4144, 4612.* Identification and analysis of courses and proposed solutions to off-normal nuclear reactor operating events. Impact on plant safety, reliability and/or availability.

ENU 5176—Principles of Nuclear Reactor Operations (3) *Prereq: ENU 4144.* Principles of control and operation and problems of power reactor operations.

ENU 5176L—Principles of Nuclear Reactor Operations Laboratory (1) *Prereq: ENU 4144 or equivalent and consent of instructor.* Principles of reactor operations applied to startup, operation, and control of the training reactor to include performing reactor physics measurements and control calibrations.

ENU 5180C—Nuclear Fuel Cycle (3) *Prereq: ENU 4101 or 4103 or 5005.* Sources of uranium, mining and milling operations, purification, isotopic enrichment, and fuel fabrication. Radiochemical properties of irradiated fuel, reprocessing, and waste disposal.

ENU 5186—Reactor Fuel Cycles (3) *Prereq: ENU 4185.* Evaluation of criticality, power peaking, and sharing throughout the burnup cycle, with reshuffle and reload. Investigation of the effects of control poisons for thorium, uranium, and plutonium cycles.

ENU 5196—Nuclear Reactor Power Plant System Dynamics and Control (3) *Prereq: ENU 4192 and EML 4522 or EEL 4657 or EML 5311.* Control theory analysis applied to nuclear power reactor dynamic models with feedback and to integrated nuclear power plant dynamic models with feedback.

ENU 5306C—Radioisotope Theory and Techniques (4) *Prereq: CHM 3120C or consent of instructor.* The theory of radioactivity, of interaction with matter, radioactivity decay given in sufficient detail to make the laboratory techniques and practices thoroughly understood.

ENU 5351—Space Nuclear Power and Propulsion (3) *Prereq: ENU 4144 and 4134.* Theory and design of space nuclear power sources including radioisotope thermoelectric generators and reactor power plants. Associated systems and components important for energy conversion, heat transport and rejection, shielding and safety.

ENU 5414—Isotope Separation (3) Stable isotopes important for conventional nuclear reactors, isotopes important for fusion, methods for separation.

ENU 5516L—Nuclear Engineering Laboratory II (2) *Prereq: ENU 4612L or 5615L and ENU 4104 or 6106.* Laboratory practice in neutron and gamma detection and analysis. Determination of basic neutron parameters in nonmultiplying and multiplying media.

ENU 5615—Nuclear Radiation Detection and Instrumentation (3) Interaction of radiation with matter, radiation detector systems, pulse shaping, amplification, amplitude and time-analyzing circuitry; counting and measuring devices, and control systems for nuclear reactors.

ENU 5615L—Nuclear Radiation Detection and Instrumentation Laboratory (1) Laboratory associated with ENU 5615.

ENU 5626—Radiation Biology (3) *Prereq: one year each of college biology, chemistry and physics; permission of instructor.* Effects of radiation on biological molecules, cells, and man including cancer and mutagenesis; use of radiation in the treatment of disease.

ENU 5658—Image Analysis with Medical Physics Applications (3) Description and processing of images obtained using X-ray/neutron fields. Filtering, enhancement, reconstruction of CT and coded aperature images. Digital and optical methods.

ENU 5705—Advanced Concepts for Nuclear Energy (3) *Prereq: ENU 4104, 4144 and EML 3100.* Plasmas and thermonuclear fusion; fast reactors, advanced LWRs, and other advanced fission reactors; nuclear pumped lasers; TE, TI, and MHD conversion and Stirling engines as applied to advanced reactor concepts.

ENU 6051—Radiation Interaction Basics and Applications I (3) Interaction of X-rays, gamma rays, neutrons, and charged particles with matter; radioactive decay, nuclear moments, and nuclear transitions. Application to basic problems in nuclear engineering sciences.

ENU 6052—Radiation Transport Basics and Applications (3) *Prereq: undergraduate classical and modern physics, and differential equations.* Particle distribution functions. Elementary transport and statistical description of particulate matter. Development of transport relations and their solutions. Applications to basic problems in nuclear engineering sciences.

ENU 6053—Radiation Interaction Basics and Applications II (3) Continuation of ENU 6051. Nuclear Structure, stability and models; nuclear reactions; ionization of matter by charged particles, neutrons, and electromagnetic radiation with application to basic problems in nuclear engineering sciences.

ENU 6061—Introduction to Medical Radiological Physics (1) *Prereq: undergraduate classical and modern physics, and differential equations.* An overview of the areas of medical radiological physics including diagnostic radiography, nuclear medicine, and radiation therapy. Basic radiation physics, biology, and safety.

ENU 6106—Nuclear Reactor Analysis I (3) *Prereq: ENU 6051.* Nuclear criticality, neutron transport equation, multigroup neutron diffusion theory, and perturbation theory. Reactor kinetics: point model, reactivity feedback, and space-time models.

ENU 6107—Nuclear Reactor Analysis II (3) *Prereq: ENU 6106.* Fast and thermal spectrum calculations for homogeneous and heterogeneous reactor cores. Nuclear reactor core design including nuclear and thermal hydraulic analyses. Core power distributions, composition changes, and reactivity control.

ENU 6117C—Neutron Transport Theory (2) *Prereq: ENU 6106.* Neutron transport equation, approximations based on orthogonal functions, variational techniques, and Monte Carlo methods applied to monoenergetic and energy-dependent transport theory.

ENU 6147—Fast Reactor Plant Design and Technology (3) *Prereq: ENU 4192 and 6106.* Theories of previous courses applied to analytical design and economics of an integrated fast reactor nuclear plant.

ENU 6210—Computational Methods of Reactor Analysis and Design (3) *Prereq: ENU 6106.* Descriptions and use of the most widely employed methods and codes used in reactor physics calculations by industry.

ENU 6241—Numerical Methods in Nuclear Engineering Sciences (3) Numerical solutions to reactor analysis problems, emphasis on the solution of one-, two-, and three-dimensional diffusion equations, multiregion and multigroup diffusion methods. P_n and S_n calculations.

ENU 6617C—Applied Gamma Ray Spectrometry (3) *Prereq: ENU 5615.* Principles, tools, and techniques of gamma-ray spectrometry with applications of radionuclide and radioactivation analysis.

ENU 6627—Therapeutic Radiological Physics (3) *Prereq: ENU 5615, 6051, 6053.* Introduction to radiation therapy physics: teletherapy, brachytherapy, interstitial therapy. Production of photons and electrons for therapeutic use. Radiation measurement and dosimetry clinical applications. Radiation protection and quality assurance.

ENU 6636—Advanced Radiation Shielding Design (2) *Prereq: ENU 6106.* Shielding design fundamentals. Methods of calculating gamma-ray attenuation, fast neutron penetration, effects of ducts and voids in shields, problems of heat generation and deposition in reactor components.

ENU 6646—Field Problems in Radiation Control (1-3; max: 3) *Prereq: ENV 4241.* On-the-job training by rotation through each phase of the radiation control program, including surveys, radionuclide receipt, storage, distribution, bioassays, personnel monitoring, record keeping.

ENU 6651—Clinical Rotation in Radiation Therapy (3) *Prereq: working knowledge of therapeutic radiological physics.* Experience in clinical therapeutic radiological procedures, patient dosimetry, and treatment planning.

ENU 6652—Clinical Rotation in Diagnostic Radiology (3) *Prereq: working knowledge of diagnostic radiological physics.* Experience in clinical diagnostic radiological procedures. Application of physical principles to imaging and the quality assurance of the imaging chain.

ENU 6656L—Medical Radiation Instrumentation and Dosimetry (1) *Prereq: ENU 6627 or equivalent.* Dosimetry instrumentation including ion chambers, semiconductor and luminescent devices; measurement in roentgens; measurement of absorbed radiation energy; manual and computer techniques in treatment planning for external beam therapy and implanted sources.

ENU 6657—Diagnostic Radiological Physics (3) *Prereq: ENU 5615, 6051, 6053.* X- and gamma-ray production and spectra. Radiopharmaceuticals. Medical imaging concepts and hardware. Clinical overview of diagnostic x-ray and nuclear medicine. Application of radiation protection principles.

ENU 6659—Nuclear Medicine Instrumentation and Procedure (2) *Prereq: ENU 5615 or equivalent.* Theory, evaluation, applications of detecting and imaging systems in nuclear medicine including collimators, scintillation probes, cameras, data-processing devices; uses of radionuclides in medicine for radiopharmaceutical preparation.

ENU 6717—Thermonuclear Fusion (2) Foundations of thermonuclear reactions. Methods of heating plasmas to extreme temperatures; plasma containment by magnetic fields; plasma instabilities.

ENU 6730—Introduction to Plasmas (2) Nomenclature, materials, and plasma devices, fundamentals of plasma kinetic theory, low and high pressure discharges, technical applications.

ENU 6905—Individual Work (1-6; max: 12) Supervised study or research in areas not covered by other graduate courses.

ENU 6910—Supervised Research (1-5; max: 5) S/U.

ENU 6935—Nuclear Seminar (1; max: 3) Discussion of research, current trends in the nuclear related industry, government, and research establishments.

ENU 6936—Special Projects in Nuclear Engineering Sciences (1-9; max: 12) Nonthesis research projects. H.

ENU 6937—Special Topics in Nuclear Engineering Sciences (1-9; max: 12) H.

ENU 6940—Supervised Teaching (1-5; max: 5) S/U.

ENU 6971—Research for Master's Thesis (1-15) S/U.

ENU 6972—Research for Engineer's Thesis (1-15) S/U.

ENU 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.

ENU 7980—Research for Doctoral Dissertation (1-15) S/U.

NURSING
College of Nursing

GRADUATE FACULTY 1993-94

Dean: L. J. Malasanos. *Graduate Coordinator:* N. W. Davidson. *Eminent Scholar:* C. Ash. *Professors:* G. C. Anderson; N. W. Davidson; M. C. Dougherty; F. Gary; S. A. Hutchinson; L. M. Malasanos; K. Smyth; M. A. White; D. D. Williams. *Associate Professors:* D. W. Campbell; K. Godbey; M. V. Graham; M. J. Marshall; J. H. Patray, S. F. Seymour; S. H. Simpson; M. J. Snider; J. K. Stechmiller; E. M. Visscher; M. E. Wilson; H. N. Yarandi. *Assistant Professors:* M. Bear; M. M. Courage; W. H. Fite; A. C. Gregg; D. J. O'Brien; R. R. Reischman; D. Treloar; C. Uphold.

The College of Nursing offers the Master of Nursing (nonthesis) and the Master of Science in Nursing (thesis) degrees with clinical specializations in adult health, child health, critical care, community health, family nurse practitioner, geriatric nurse practitioner, neonatal nursing, nurse midwifery, nursing administration, oncology nursing, pediatric nurse practitioner, psychiatric and mental health, and women's nursing. The functional roles of clinical specialist, nurse educator, nursing administrator, or nurse practitioner are offered.

In addition to meeting the requirements of the Graduate School, an applicant must have an active R.N. license, a year's clinical practice in the area of the clinical specialty, a baccalaureate degree in nursing from an accredited program with an upper division nursing major, a two- or three-credit college-level course in statistics, and demonstrated proficiency in physical assessment. Curriculum alternatives are available for nurses holding baccalaureate or higher degrees in fields other than nursing.

The College of Nursing offers the Doctor of Philosophy in nursing sciences. Students are expected to meet all requirements for admission to the master's program and to have a master's degree in nursing with a clinical specialty. Students are expected to complete a series of courses specified by the College of Nursing and complete a minor outside of the College. Admission to doctoral studies in nursing is through appropriate application to the Graduate School and the College Admission Committee. The purpose of the doctoral program in nursing sciences is to prepare nurse scholars and researchers who will be expert clinicians, teachers, or administrators.

NGR 5610—Nursing Implications of Family Systems (2) Bowen's Family Theory as a framework for assessment and care of patients and families.

NGR 5921—Nursing Implications of Sexuality in Health and Illness (2)

NGR 5934—Cultural Influences on Health Care (2)

NGR 5940C—Internship in Professional Nursing (2; max: 8)

NGR 6110—Theoretical Models for Nursing (3) *Required of all students.* Study of theoretical and conceptual models for nursing practice, research, and education.

NGR 6130—Ethical Perspectives in Nursing (3) *Prereq: knowledge of philosophy.* Process for analysis of ethical dilemmas in nursing and health care resulting from conflicting theories and frames of reference.

NGR 6140—Physiological and Pathophysiological Bases of Professional Nursing (3) *Required of all students.* Human physiology including normal changes throughout the life span, pathophysiology, and their implications for nursing.

NGR 6190—Nursing and Health Policy (3) *Required of all students.* Policy processes (intramural/extramural) related to contemporary issues in nursing and health and in using data bases and decision-making skills for policy formulation, implementation, and evaluation.

NGR 6200C—Adult Health Nursing I (6) *Prereq/coreq: NGR 6110, 6140.* Advanced application of theory for promotion, maintenance, and restoration of health in the acute phase of illness.

NGR 6201C—Adult Health Nursing II (6) *Prereq/coreq: NGR 6110, 6140.* Advanced application of theory for promotion, maintenance, and restoration of health for adults with chronic disease or health problems.

NGR 6232C—Adult Critical Care Nursing I (6) *Prereq/coreq: NGR 6110, 6140.* Assessment of health problems and implementation of care for adults in critical phase of illness with focus on pathophysiological processes.

NGR 6234C—Adult Critical Care Nursing II (6) *Prereq: NGR 6110, 6140.* Major adult health problems in the acute/critical phase of illness with focus on physiologic and psychologic adaptive response.

NGR 6250C—Geriatric Nursing I (6) *Prereq/coreq: NGR 6110, 6140.* Application of nursing process based on biological theories of aging, normal and abnormal physical changes, adaptive and maladaptive behavior common to aged.

NGR 6251C—Geriatric Nursing II (6) *Prereq: NGR 6250C.* Application of nursing process based on adaptive behavior patterns for promotion, maintenance, and restoration of health in the aged.

NGR 6300C—Child Health Nursing I (6) Exploration and application of concepts and theories for advanced child health nursing practice.

NGR 6301C—Child Health Nursing II (6) *Prereq: NGR 6300C.* Analysis and application of selected theories for the formulation of nursing interventions appropriate to advanced clinical practice.

NGR 6310—Nursing Care of Clients with Congenital Anomalies (3) Nursing implications of abnormal embryological growth and development and evaluation of congenital defects.

NGR 6320C—Neonatal Intensive Care Nursing I (6) *Prereq/coreq: NGR 6140.* Advanced neonatal theory and care of high risk critically ill neonates.

NGR 6321C—Neonatal Intensive Care Nursing II (6) *Prereq/coreq: NGR 6140.* Advanced theory and care of chronically ill neonates.

NGR 6331C—Pediatric Primary Care I (6) *Prereq/coreq: NGR 6140.* Advanced study in nursing for the maintenance of health and prevention of diseases in children.

NGR 6332C—Pediatric Primary Care II (6) *Prereq: NGR 6331C.* Nurse practitioner management of common pediatric health problems.

NGR 6400C—Women's Health Nursing I (6) *Prereq/coreq: NGR 6140.* Development of advanced knowledge and skills in care of antepartal and postpartal clients.

NGR 6401C—Women's Health Nursing II (6) *Prereq: NGR 6400C.* Advanced knowledge and skills required for care of women's reproductive problems throughout life span.

NGR 6450C—Nurse-Midwifery I (5) *Prereq/coreq: NGR 6140.* Nurse-midwifery management of ambulatory health care for women seeking gynecological or family-planning care, primary care, and management of normal neonates.

NGR 6451C—Nurse-Midwifery II (4) *Prereq: NGR 6140; 6450C.* Ambulatory health care and nurse-midwifery management of low-risk women during antepartal period.

NGR 6452C—Nurse-Midwifery III (7) *Prereq: NGR 6451C; coreq: NGR 6944C.* Intrapartal care and management of low-risk mothers and newborns during the labor/delivery, postpartal, and neonatal periods.

NGR 6500C—Adult Psychiatric-Mental Health Nursing I (6) *Prereq: NGR 6110, 6140.* Assessment, prevention, and/or treatment and rehabilitation of clients with major psychiatric disorders.

NGR 6501C—Adult Psychiatric-Mental Health Nursing II (6) *Prereq: NGR 6500C.* Current theories and practices in therapy for psychiatric and mentally ill populations.

NGR 6536C—Child and Adolescent Psychiatric-Mental Health Nursing I (6) *Prereq/coreq: NGR 6110.* Assessment, prevention, treatment, and rehabilitation of severe psychiatric dysfunctions in children.

NGR 6537C—Child and Adolescent Psychiatric-Mental Health Nursing II (6) *Prereq/coreq: NGR 6536C.* Current issues, theories, and practices in therapy for severely disturbed children and youths.

NGR 6538—Psychopharmacology for Psychiatric Nursing (3) *Prereq: six credits in psychiatric nursing.* Knowledge base for prescription and management of psychotropic medications in treatment of psychiatric disorders.

NGR 6601C—Family Nurse Practitioner I (6) *Prereq/coreq: NGR 6140.* Theories and practice in health care of reproductive families and children from infancy through adolescence.

NGR 6602C—Family Nurse Practitioner II (6) *Prereq: NGR 6601C.* Theories and practice in the health care of individuals in early, middle, and late adulthood.

NGR 6609—Family Dynamics and Organized Health Care (3) Relation of the family to organized health care within theories of choice, exchange, and the mechanism of reciprocity.

NGR 6620C—Community Health Nursing I (6) *Prereq/coreq: NGR 6110.* Community health care with emphasis on assessment, health maintenance, and clinical practice.

NGR 6621C—Community Health Nursing II (6) *Prereq: NGR 6620C.* Nursing management of health problems of families and communities with focus on implementation and evaluation.

NGR 6625—Models of Community Health Nursing I (3) *Prereq/coreq: NGR 6110.* Needs assessment and program planning as basis for health attainment of communities and families.
NGR 6626—Models of Community Health Nursing II (3) *Prereq: NGR 6625.* Implementation and evaluation of community health programs.
NGR 6700—Leadership and Management in Nursing (3) *Required of all students.* Analysis of selected leadership behaviors applied to roles of clinical specialist, practitioner, administrator, and educator.
NGR 6710—Seminar: The Nurse Educator (3) *Prereq: NGR 6700 and 6 credits in clinical courses.* Seminar for analysis and synthesis of role behaviors specific to the nurse educator in a variety of collegiate settings.
NGR 6722—Fiscal Aspects of Nursing Administration (3) Fiscal accountability in health care systems, health care economics, and budgetary processes for nurse administrators.
NGR 6730C—Nursing Administration: Theory (3) *Prereq: NGR 6110, 6700; coreq: NGR 6944.* Analysis of theories related to administrative process, organizational structure, and behavior within health care delivery systems with focus on nursing.
NGR 6733—Human Resources Management (3) *Prereq: NGR 6730C.* Human resources in health care organizations including personnel management, information systems, staff development, and labor/management relations.
NGR 6734—Nursing Administration: Organizational Behavior (3) *Prereq: NGR 6110, 6700; coreq: NGR 6110, 6944.* Organizational behavior related to role, purpose, and functions of the nurse in communication, conflict, motivation, and working with groups.
NGR 6740—Seminar: The Nurse Practitioner (2) *Prereq: NGR 6190 and 6 credits in clinical courses.* Seminar for analysis of current practice issues and role behaviors of the nurse practitioner in primary care settings.
NGR 6751—Seminar: The Nurse Midwife (2) *Prereq/coreq: NGR 6452C. Required for nurse-midwifery students.* Analysis and synthesis of role behaviors of the nurse-midwife as a clinical specialist in selected settings.
NGR 6800—Research Methods in Nursing (3) *Prereq/coreq: NGR 6110. Required for all students.* Explores research in nursing and the process by which inquiry relevant to nursing is accomplished. Includes the development of a research proposal.
NGR 6801—Statistical Methods in Nursing Research (3) *Required for all students.* Analysis and presentations of data. Students' two group designs, one- and two-way analysis of variance, correlation and simple linear regression, and analysis of covariance for clinical data.
NGR 6815—Foundations of Qualitative Research in Nursing (3) *Prereq: NGR 6800; 6110.* Introduction to philosophical, historical, and theoretical bases.
NGR 6905—Individual Study (1-3; max: 6)
NGR 6910—Supervised Research (1-5; max: 5) S/U.
NGR 6930—Special Topics in Nursing (1-3; max: 6)
NGR 6940—Supervised Teaching (1-5; max: 5) S/U.
NGR 6941—Practicum in Nursing (3-6; max: 6) *Prereq: satisfactory completion of core and clinical courses. Required for all students.*
NGR 6944—Individual Clinical Practice (1-4; max: 6) *Prereq: enrollment in or completion of graduate level courses in clinical nursing.* Additional opportunities for advanced nursing practice. Objectives to be developed collaboratively by student and faculty.
NGR 6970—Research for Master's Project (1-4) S/U.
NGR 6971—Research for Master's Thesis (1-15) S/U.
NGR 7115—Philosophy of Nursing Science (3) Critical examination of the meaning, method, and logical structures of science and nursing sciences with emphasis on the logical methodological analyses of aims, methods, criteria, concepts, laws, and theories.
NGR 7124—Nursing Theory: Analysis and Critique (3) *Prereq: NGR 6110, 6800, 6801, 7115.* Examination of extant theories in nursing.
NGR 7730—Advanced Seminar in Nursing (1-3; max: 3) Analysis and critique of clinical problems in selected nursing specialty areas.
NGR 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.
NGR 7980—Research for Doctoral Dissertation (1-15) S/U.

OCCUPATIONAL THERAPY
College of Health Related Professions

GRADUATE FACULTY 1993-94

Chair: K. F. Walker. *Graduate Coordinator:* R. J. Miller. *Professors:* J. VanDeusen. *Associate Professors:* R. J. Miller; E. R. Vergara; K. F. Walker.

The Department of Occupational Therapy offers a graduate program in occupational therapy leading to the Master of Health Science degree. Its emphasis is on research and advanced theories related to occupational therapy practice. Preparation for teaching, administrative, and other occupational therapy roles is supplemented through elective courses. A coherent series of elective courses related to occupational therapy must be approved by the supervisory committee chairperson before the second semester of work.

In addition to the requirements of the Graduate School, admission to graduate study in occupational therapy requires the candidate to (1) have a bachelor's degree and (2) have completed an accredited curriculum in occupational therapy or an approved program of postbaccalaureate studies in occupational therapy. Current registration with the American Occupational Therapy Association is acceptable as evidence of completion of an accredited curriculum. A course in basic statistics is required for admission.

In addition to graduate courses in occupational therapy, students are required to take *STA 6127,* Statistical Methods in Social Research II, or an equivalent course.

OTH 6419—Occupational Therapy Management (2) *Prereq: OTH 4935 or equivalent.*
OTH 6420—Seminar in Adult Perceptual—Motor Dysfunction for Occupational Therapists (2-3; max: 3) *Prereq: registered occupational therapist or consent of instructor.*
OTH 6539—Seminar in Occupational Therapy Theory I (3) Historical and current theoretical bases of occupational therapy.
OTH 6549—Seminar in Occupational Therapy Theory II (2) *Prereq: consent of instructor.* Continuation of advanced theories with emphasis on contemporary theories and trends.
OTH 6770—Applied Research in Occupational Therapy I (2) Investigation of clinical, academic, or administrative problems in occupational therapy.
OTH 6780—Applied Research in Occupational Therapy II (3) *Prereq: OTH 6770.* Continuation of OTH 6770 with emphasis on completion of a research project and its oral and written dissemination. H.
OTH 6861L—Specialty Residency (2-9; max: 9) *Prereq: OTH 6780.* Field experience in clinical, community, educational, and administrative settings approved by the department.
OTH 6905—Individual Work (1-10; max: 10) Project related to teaching, research, administration, or clinical practice.
OTH 6933—Special Topics in Occupational Therapy (2-9; max: 9) Selected topics in theory and research in occupational therapy.

ORAL BIOLOGY
College of Medicine

GRADUATE FACULTY 1993-94

Chairman: A. S. Bleiweis. *Graduate Coordinator:* T. A. Brown. *Graduate Research Professor:* A. S. Bleiweis. *Distinguished Service Professor:* P. E. Mahan *(Emeritus). Professors:* W. B. Clark; W. P. Duff; W. Fischlschweiger; C. H. Gibbs; T. M. Hassell; J. B. Hillman; G. J. King; N. I. Magnusson; W. P. McArthur; C. B. Walker. *Associate Professors:* T. A. Brown; L. L. Brinkley; M. G. Humphreys-Beher; M. J. Koroly; A. Progulske-Fox; T. T. Wheeler; W. N. Williams.

The Department of Oral Biology, a unit of the College of Dentistry, offers a program leading to the degree of Doctor of Philosophy in medical sciences with specialization in oral biology.

Training includes appropriate course work and research in areas such as microbiology, immunology, molecular biology, pathology, histology, electron microscopy and ultrastructure, anatomy and neurophysiology of the head and neck, and speech dysfunction due to anatomic malformations. Students are taught research methods in a supervised program of laboratory rotations (GMS 6905) and in the selected laboratory (GMS 6910). Independent advanced research is conducted prior to admission to candidacy (GMS 7979) and for the doctoral dissertation (GMS 7980).

Prerequisites for admission in addition to those of the Graduate School, include a broad base of courses in mathematics, physics, organic and analytic chemistry, advanced biology, and statistical methods. Specific requirements may be obtained from the Graduate Coordinator.

GMS 6160—Introduction to Oral Biology I (2) Survey of anatomy and development of head and neck, oral histology and ultrastructure, salivary gland function, oral sensory function, and pathology of the periodontium and teeth.

GMS 6161—Introduction to Oral Biology II (2) *Prereq: GMS 6160 or consent of instructor.* Survey of microbial and viral pathogens responsible for oral diseases, host defense mechanisms in oral cavity, and aspects of cell biology relevant to functions of oral soft tissues.

GMS 6170—Immunology and Immunopathology of the Oral Cavity (2) Specific and nonspecific immune factors in saliva, with special emphasis on secretory IgA. Immunology and immunopathology of oral soft tissues.

GMS 6171—Experimental Techniques in Light and Electron Microscopy (4) Aspects of light and electron microscopy that pertain to biological and medical research. Laboratory includes training in cell and tissue processing, sectioning, staining, light and electron microscopy and photography.

GMS 6172—Molecular Biology and Pathology of the Periodontium (2) *Coreq: GMS 6121, 6140.* Ultrastructure and biochemical composition of periodontal tissues, the microbial interrelations with the organic and inorganic components of periodontal tissues, the biochemical dynamics of gingival inflammation, and wound healing and the metabolic processes responsible for the composition and flow of the gingival crevicular fluid.

GMS 6173—Stomatognathic System: Form and Function (2) *Prereq: GMS 5630; coreq: BMS 6510.* Anatomy and function of head and neck muscles, temporomandibular joints, and salivary glands. Normal and abnormal mastication, deglutition, speech, and oral sensorimotor measures.

GMS 6174—Oral Microbial Systems (2) *Coreq: GMS 6121, 6140.* Major bacterial pathogens of the oral cavity: their morphology, physiology, genetics, and ecologic associations. Roles of key organisms in oral diseases (e.g., caries and periodontitis) stressed.

GMS 6176—Biology of Tooth Supporting Structures I (1) *Coreq: BCH 6740 or consent of instructor.* Organization, vasculature, and innervation of the periodontium; chemistry; biosynthesis, biophysics, and degradation of collagen; studies of other associated, unique proteins.

GMS 6177—Biology of Tooth Supporting Structures II (1) *Prereq: GMS 6176; coreq: BCH 6206 or consent of instructor.* Development and function of the periodontal ligament; organization, development, biophysics, and biochemistry of bone; calcification mechanisms and bone remodeling; effects of hormones and nutrients on bone.

GMS 6178—Glycoproteins: Structure, Function, and Biosynthesis (3) *Prereq: BCH 6740.* Current findings on the structures of N- and O-linked oligosaccharides, biosynthetic enzymes, intracellular trafficking, and biological functions.

GMS 6193—Research Conference in Oral Biology (1; max: 8) Critical discussion and appraisal of current research within department by students and faculty. S/U.

GMS 7179—Journal Colloquy (1; max: 8) *Required of graduate students in oral biology; open to others by permission of the department.* Critical presentation and discussion of recent original articles in the oral biology literature.

PATHOLOGY AND LABORATORY MEDICINE
College of Medicine

GRADUATE FACULTY 1993-94

Chairman: N. Maclaren. *Associate Chairman:* R. L. Hackett. *Graduate Coordinator:* S. R. Khan. *Graduate Research Professor:* H. M. Johnson. *Professors:* R. C. Braylan; B. P. Croker; W. H. Donnelly; R. L. Hackett; P. A. Klein; N. K. Maclaren; S. J. Normann; A. B. Peck; K. H. Rand; J. C. Scornik; R. T. Smith; E. K. Wakeland; E. J. Wilkinson; J. C. Woodard. *Associate Professors:* R. L. Bertholf; C. D. Buergelt; K. J. Kao; S. R. Khan; W. E. Winter; J. R. Zucali. *Assistant Professors:* M. A. Atkinson; M. M. Goodenow; J. Hendricks; S. M. Jong; M. T. McCormack; W. K. Potts; G. Segal; L. J. Smith; F. Y. Tung.

The Department of Pathology and Laboratory Medicine, College of Medicine, in association with the Department of Comparative and Experimental Pathology, College of Veterinary Medicine, offers a program leading to the Doctor of Philosophy degree in medical sciences, specializing in immunology and molecular pathology. Areas of research within this program include cellular and molecular immunology, immunogenetics, immunochemistry, immunopathology, immunology of infectious diseases, tumor biology and virology, membrane biochemistry, molecular biology, and comparative and nutritional pathology.

The Department of Pathology and Laboratory Medicine also offers a program leading to the Master of Science degree in medical sciences, specializing in clinical chemistry, clinical immunology, or clinical virology.

The specialization in experimental pathology and immunology emphasizes basic research while concentrations in clinical chemistry, clinical immunology, and clinical virology emphasize laboratory training for management and supervision of clinical laboratories. Careers in pathology offer a diversity of opportunities: service in diagnostic laboratories, basic research in immunology, pathology or genetic engineering, and teaching.

Graduate students entering the experimental pathology and immunology specialization should have adequate undergraduate training in chemistry, biology, physics, and mathematics, with special emphasis on physiological, developmental, and cellular biology. Flexibility in the graduate program permits the student's course curriculum to be arranged according to his/her specific interests and needs. Each student is required to have a minimum of six credits each of pathology, immunology, cell science, and biochemistry/microbial genetics prior to taking the Ph.D. qualifying examination.

Immunology and Molecular Pathology

BMS 5603—Genetic, Molecular, and Cellular Bases of Disease (3) Analysis of concepts underlying the pathologic development and consequences of disease with discussions of current research literature. Cell response to injury, genetic predisposition to disease, autoaggression, autoimmunity, immunodeficiency diseases, and altered cell growth and cancer.

BMS 7920—Colloquium in Experimental Pathology and Immunology (1; max: 12) *Required of graduate students in pathology; open to others by permission of the department.* Critical presentation and discussion of recent original articles in the fields of pathology, immunology, and molecular biology.

GMS 5304C—Mechanisms of Disease (1-3; max: 3) Multidisciplinary approach to disease and its prevention, coordinating molecular, structural, and functional alterations with emphasis on inflammation and on microbial, toxicological, and ischemia injury.

GMS 6140—Principles of Immunology (3-5; max: 5) Biological and biochemical aspects of hosts resistance and immunity; the chemical and physiochemical properties of the proteins of immune reactions.

GMS 6330—Tumor Biology (3) *Prereq: cell biology, molecular biology, or consent of instructor.* Molecular pathology of neoplasia; ocogenes and tumor suppressor genes; tumor progression and metastasis. Advanced topics format with emphasis on critical evaluation of experiments and grant writing.

GMS 6332—Advanced Topics in Cancer Research (3) *Prereq: GMS 6140, BMS 5603.* Analysis and discussion of contemporary topics in tumor biology and molecular mechanisms of oncogenesis to obtain a comprehensive understanding of the development of current concepts. Evaluation of the most recently published research literature. Seminars and discussions with invited speakers.

GMS 6333—Mammalian Genetics and Inheritance of Disease Susceptibility (3) *Prereq: BCH 6415 or GMS 6152 or consent of instructor.* Basic principles of genetics in mammals including man. Inheritance of disease and disease susceptibility with detailed examples and relevance to current medical knowledge.

GMS 6342L—Experimental Immunology (2) *Prereq: consent of instructor; coreq: GMS 6140.* Project oriented. Laboratory skills and techniques in immunobiology developed. Each student works in close association with a faculty member.

GMS 6646—Experimental Pathology and Immunology: A Rotation (2-12; max: 16) *Prereq: GMS 6140, BMS 5603, and consent of instructor.* Individual investigative projects. Participation in all phases of experimental pathology and immunology. Laboratory training in methodology and data interpretation of basic research. Students specializing in experimental pathology and immunology must spend three semesters on this rotation.

GMS 6347—Advanced Methods in Immunology (2) *Prereq: consent of instructor; coreq: GMS 6140.* A laboratory course to gain practical experience with methods used in immunology research today. Cell separation and identification techniques, isolation and analysis of protein structure, electrophoretic and chromatographic isolation procedures, hybridoma production and monoclonal antibody screening procedures, and genetic engineering.

GMS 6380—Special Subjects in Systemic Pathology (1-3; max: 3) *Prereq: consent of instructor.* Pathological processes affecting specific organs and organ systems.

GMS 6381—Special Topics in Pathology (1-4; max: 12) *Prereq: permission of department.* Conferences and supervised laboratory work. Topics selected to meet each student's needs.

GMS 6382—Special Topics in Immunology (3; max: 6) *Prereq: GMS 6140.* Analysis and discussion of contemporary topics in immunology to obtain a comprehensive understanding of the development of current concepts. Evaluation of the most recently published research literature. Seminars and discussions with invited speakers.

GMS 6390—Seminar in Pathology (1; max: 12) *Required of graduate students in pathology; open to others by permission of the department.* Current research literature and research reports by graduate students, pathology staff, and invited speakers. S/U.

GMS 6394—Seminar in Mammalian Genetics (1; max: 12) Research reports in mammalian genetics given by invited speakers, genetics faculty, and graduate students. S/U.

Clinical Chemistry

GMS 6312—Clinical Chemistry and Toxicology (3) Comprehensive review of analytical techniques used in clinical chemistry and toxicology, and interpretation of laboratory data..

GMS 6313—Clinical Chemistry and Toxicology: A Rotation (2-20; max: 20) *Prereq: GMS 6312.* Participation in all phases of practical clinical chemistry and toxicology. Chemical methodology, clinical interpretation, and significance of laboratory measurements used in diagnosing diseases. Individual investigative project in clinical chemistry and toxicology. Pathology graduate students specializing in clinical chemistry must spend three semesters on this rotation. S/U.

GMS 6393—Seminar in Clinical Chemistry (1; max: 7) *Prereq: consent of instructor; coreq: GMS 6312.* Reports and discussions of current research and clinical literature presented by faculty, invited speakers, and graduate students. S/U.

PHARMACEUTICAL SCIENCES—GENERAL
College of Pharmacy

Dean: M. A. Schwartz. *Associate Dean for Research and Graduate Studies:* R. Dawson.

The College of Pharmacy offers the Doctor of Philosophy and the Master of Science in Pharmacy degrees in the pharmaceutical sciences, with specialization in medicinal chemistry, pharmacodynamics, and pharmacy which includes pharmaceutics and pharmacy health care administration.

The graduate faculty and courses offered are listed under department headings in this *Catalog.* The courses listed below consist of seminar, supervised teaching, and research for thesis or doctoral dissertation. These courses are offered in each of the departments except the Department of Pharmacy Practice.

For specific information on courses in the Department of Medicinal Chemistry please see page 139. This department is within the College of Pharmacy.

Students who wish to pursue graduate studies in the Departments of Medicinal Chemistry, Pharmaceutics, Pharmacodynamics, and Pharmacy Health Care Administration must have an undergraduate degree in pharmacy, chemistry, biology, or related sciences.

Satisfactory completion of a thesis or dissertation based on research is a requirement for a graduate degree in the pharmaceutical sciences.

Inquiries regarding applications and general information about the graduate programs are processed through the Office of Research and Graduate Studies, College of Pharmacy, P. O. Box 100487, Health Science Center.

PHA 6905L—Research Methods in Pharmaceutical Sciences (1-4; max: 12)
PHA 6910—Supervised Research (1-5; max: 5) S/U.
PHA 6935—Selected Topics in Pharmacy (2; max: 4) Open to all departments in the College of Pharmacy.
PHA 6936—Advanced Topics in Pharmaceutical Sciences (1; max: 4) Written and oral presentation of research designs, protocols, papers, and critical appraisals with discussion and critical review of such topics.
PHA 6938—Research Seminar (1; max: 3) Seminar required of graduate students in the College of Pharmacy. S/U option.
PHA 6940—Supervised Teaching (1-5; max: 5) S/U.
PHA 6971—Research for Master's Thesis (1-15) S/U.
PHA 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.
PHA 7980—Research for Doctoral Dissertation (1-15) S/U.

PHARMACEUTICS
College of Pharmacy

GRADUATE FACULTY 1993-94

Chairman: H. Derendorf. *Graduate Coordinator:* I Tebbett. *Graduate Research Professor:* N. Bodor. *Professors:* H. Derendorf; M.A. Schwartz. *Associate Professors:* G. Hochhaus; I. Tebbett. *Assistant Professors:* G. Brazeau; L. Prokai.

The Department of Pharmaceutics offers the Doctor of Philosophy and Master of Science in Pharmacy in the pharmaceutical sciences. Pharmaceutics is the scientific endeavor concerned with the design, formulation, evaluation, and use of drug delivery systems. A foundation in physical chemistry, chemistry, mathematics, as well as in the life sciences, is necessary. Its domain extends from studies of the physiochemical properties of drugs and related molecules to investigations of the mechanisms of physiological processes affecting drug delivery and therapeutic effectiveness.

The general focus of research in the Department involves the study of the design and evaluation of the dosage form. The design involves physical chemical studies and development of analytical techniques involving spectroscopy and chromatography. Evaluation includes the development of sensitive analytical techniques for the drug in biological fluids and the subsequent biopharmaceutical and clinical pharmacokinetic studies.

PHA 5121—Clinical Pharmacokinetics (4) Integrating and applying pharmacokinetic principles to formulate a rational dosage regimen considering various patient factors and drug product factors.
PHA 5124—Biopharmaceutics (4) Time course of drugs in the body with reference to their absorption, distribution, metabolism, and elimination. Rate processes, the physiochemical influences on absorption, distribution, metabolism, and elimination and formulation factors involved in drug delivery and availability.
PHA 5126—Surface Chemistry of Biological Systems (2) Surface chemistry of fluid interfaces and its application to biomembranes and drug biomolecule interactions.
PHA 5161—Pharmaceutical Biotechnology (3) Principles of recombinant DNA technology necessary to interact and communicate as a pharmaceutical scientist within biotechnology field. Discussion of recombinant peptide and protein drugs, including protein purification, stability, quality control, and dosage form design.
PHA 6107C—Parenterals (3) Principles of preparation and sterilization. Properties of materials, stability, and interactions.
PHA 6115—Equilibria, Complexations, and Interactions of Drugs (3) Models for drug interactions in solution. Physical chemistry characteristics of drugs and their complexes in pharmaceutical systems.
PHA 6116—Stability and Kinetics of Drugs (3) Kinetics, mechanisms, and prediction of stability of in vitro transformations of drugs in solution and in dosage forms.
PHA 6125—Pharmacokinetics and Biopharmaceutics (3) Compartmental analysis with computers.
PHA 6170C—Pharmaceutical Product Formulation (3) The rationale and design of pharmaceutical dosage forms.
PHA 6416—Pharmaceutical Analysis I (3) Theory and applications of separation of drugs and breakdown products from dosage forms and biological media.
PHA 6417—Pharmaceutical Analysis II (3) Absorption, fluorescence, phosphorescence, and spectroanalysis of drugs and related compounds.

PHARMACODYNAMICS
College of Pharmacy

GRADUATE FACULTY 1993-94

Chairman: M. J. Meldrum. *Graduate Coordinator:* J. N. Peris. *Professors:* K. F. Finger; M. J. Katovich; J. W. Simpkins. *Associate Professors:* R. Dawson; M. Keller-Wood; M. J. Meldrum; W. J. Millard; C. A. Sninsky. *Assistant Professor:* J. N. Peris.

The Department of Pharmacodynamics offers the Doctor of Philosophy and Master of Science in Pharmacy in the pharmaceutical sciences with a specialization in pharmacodynamics. Pharmacodynamics is an integrated field of study involving pharmacology, physiology, and toxicology in a holistic approach to drug action in living systems. The Department focuses on neuroendocrinology, cardiovascular pharmacology, and neuropharmacology with diverse research interests in aging, hypertension, reproduction, menopause, neurotoxicity, and environmental physiology.

An undergraduate degree in pharmacy, chemistry, biology or related sciences is required. In addition to graduate courses in pharmacy, courses are taken in pharmacology and biochemistry in the College of Medicine and in statistics in the College of Liberal Arts and Sciences.

GMS 5403—Advanced Endocrinology (4) *Prereq: GMS 5400C, PHA 3500, 3501 or equivalent, consent of instructor.* Readings discussions, and lectures on recent advances in endocrinology.
PHA 5531—Neurotoxicology (2) *Prereq: biochemistry, physiology, and consent of instructor.* Survey of major classes of agents known to cause toxic effects in central and peripheral nervous systems. Emphasis on compounds' mechanism of action and experimental techniques for evaluation of neurotoxicity.
PHA 6508—Mammalian Physiology I (4) *Prereq: background in the biological sciences or consent of instructor.* Homeostatic regulation of the musculoskeletal, neural and endocrine systems with emphasis on integrative research approach.
PHA 6509—Mammalian Physiology II (4) *Prereq: PHA 6508 or*

consent of instructor. Homeostatic regulation of the respiratory, circulatory, renal, and gastrointestinal organ systems with emphasis on integrative research approach.

PHA 6521C—Research Techniques in Pharmacodynamics (2) *Prereq: graduate standing.* Discussions and laboratory practical experience with research techniques.

PHA 6540—Neurochemical Foundation of Pharmacodynamics (3) Introduction to neurochemical mechanisms involved in drug action. Overview of neurotransmitter biochemistry along with receptor pharmacology. Emphasis on both methodological and theoretical aspects of neurotransmitter metabolism and function.

PHA 6541—Pharmacodynamics of Drugs of Abuse (3) *Prereq: PHA 6540 or GMS 6500 or 6735 or consent of instructor.* Readings, discussion, and lectures on recent advances in study of how drugs of abuse affect neurophysiology. Emphasis on theoretical aspects of neurotransmission.

PHA 7939—Journal Colloquy in Pharmacodynamics (1; max: 8) Critical presentation and discussion of recent original articles.

PHARMACOLOGY AND THERAPEUTICS
College of Medicine

GRADUATE FACULTY 1993-94

Chairman: S. P. Baker. *Graduate Coordinator:* W. R. Kem. *Graduate Research Professors:* H. M. Johnson; T. H. Maren. *Professors:* S. P. Baker; L. Belardinelli; M. Corbett; F. T. Crews; K. F. Finger; L. C. Garg; E. Goldberg; M. J. Greenberg; M. O. James; W. R. Kem; K. C. Leibman (*Emeritus*); A. H. Neims; K. T. Shiverick; D. N. Silverman; C. Wilcox. *Associate Professors:* M. G. Humphreys-Beher; E. M. Meyer; W. J. Millard; T. F. Muther; T. C. Rowe; P. Scarpace. *Associate Scientist:* C. K. Tu. *Assistant Professors:* N. Guzman; M. E. Knight; A. J. Mariotti. *Assistant Scientist:* S. E. Borst.

The Department of Pharmacology and Therapeutics offers a program leading to the degree of Doctor of Philosophy in the medical sciences with specialization in pharmacology.

The general focus research of the Department is mechanistic, at the cellular and molecular levels. Specific areas of research include receptor and membrane pharmacology; autonomic, renal, developmental, endocrine, gastrointestinal, and neuropharmacology; teratology; fluid secretion and carbonic anhydrase inhibition; cancer chemotherapy and carcinogenesis; physical chemistry of enzymes; opioid peptides; drug metabolism; and environment and marine toxicology.

Applicants should present undergraduate course credits in chemistry; elementary physics and biology; and mathematics through calculus. Otherwise well-qualified students with certain deficiences in preparation will be allowed to make these up during the first year of graduate study. In addition to elementary and advanced study in pharmacology, candidates will pursue courses in biochemistry, physiology, and other medical sciences as determined by consultation with their advisory committees.

8MS 5473—Advanced Medical Pharmacology (4)

GMS 6500—Introduction to Pharmacology (6) *Prereq: elementary courses in biochemistry and physiology.* Overview of the entire field of pharmacology as the study of the interactions between living systems and foreign chemicals. Intended to prepare majors for advanced courses or to familiarize nonmajors with the area.

GMS 6520—Autonomic and Cellular Pharmacology (2) *Prereq: GMS 6500.* A biochemical approach to the actions of drugs on the autonomic nervous system, receptor coupling mechanisms, modulation of neurotransmitter release, and immune system pharmacology.

GMS 6530—Renal and Endocrine Pharmacology (2) *Prereq: GMS 6500.* Pharmacology and toxicology of hormones and renal drugs.

GMS 6563—Molecular Pharmacology (3) *Prereq: GMS 6500, CHM 3401.* A biochemical approach to the actions of drugs, stressing analysis of drug-receptor interactions, structure-activity relationships, kinetics of distribution of drugs, and metabolism of foreign compounds.

GMS 6590—Seminar in Pharmacology (1; max: 15) *Prereq: GMS 6500.* Research reports and discussions of current research literature by graduate students, faculty, and invited lecturers.

GMS 6735—Neuropharmacology (3) *Prereq: background in biochemistry and basic neuroscience or consent of instructor.* Identification, synthesis, metabolism, and pharmacology of neurotransmitters and their receptors, to include biogenic amines, neuropeptides, and other nervous system transmitters.

GMS 7591—Research Methods in Pharmacology (1-3; max: 6) Readings, discussions, and practical experience with modern methods used in pharmacology. Chemical and biological methods.

GMS 7593—Topics in Pharmacology and Toxicology (1-3; max: 12) Seminars, informal conferences, or laboratory work on selected topics.

PHARMACY HEALTH CARE ADMINISTRATION
College of Pharmacy

GRADUATE FACULTY 1993-94

Chairman: C. D. Hepler. *Graduate Coordinator:* R. Segal. *Professors:* D. B. Brushwood; C. D. Hepler. *Associate Professors:* D. H. Berardo; C. L. Kimberlin; L. D. Ried; R. Segal. *Assistant Professors:* E. E. Lipowski; P. L. Ranelli.

Research in the Department emphasizes the sociobehavioral, administrative, legal, and economic aspects of drug therapy and pharmaceutical services, including assessment of safety, effectiveness, and efficiency aspects of patient-oriented pharmaceutical services.

Graduate studies include core curricula encompassing the drug use process, statistics and research design, behavioral sciences, and economics. Electives and required courses draw from the resources of the entire University. They provide necessary concepts, knowledge, and skills for practical problem-solving and basic research. Graduates are prepared for leadership positions in academia, public service, and practice management related to drug therapy and pharmacy practice.

Applicants with backgrounds in pharmacy, nursing, other health professions, or behavioral sciences are welcomed. Admission to the graduate program does not require a degree in pharmacy or another health profession although some familiarity with health care and health professions is recommended.

PHA 5211—Pharmacy Management (5) *Prereq: enrollment in PharmD/MBA program or by permission of instructor.* Manage-

ment techniques to assist pharmacists in achieving their patient care objectives. Personnel management, fiscal management, and systems management.

PHA 5213—Quality Assessment and Improvement (2) *Prereq: enrollment in PharmD/MBA program or by permission of instructor.* Health care quality assessment and improvement at patient and system levels, including techniques for identification and analysis of problems in quality of care, and design, implementation, and evaluation of programs to improve quality of pharmaceutical care.

PHA 5233—Pharmaceutical Law (3) *Prereq: enrollment in PharmD/MBA program or by permission of instructor.* Focus on patient's right to responsible care and pharmacist's duty to provide responsible care.

PHA 5745—Professional Communications (2) *Prereq: enrollment in PharmD/MBA program or by permission of instructor.* Patient-centered communication and colleague-centered communication. Skills taught are specific to functions clinical pharmacists perform in practice.

PHA 6235—Advanced Pharmaceutical Law (2) Study of the federal Food, Drug, and Cosmetics Act and various state and local laws applicable to drug manufacturers, wholesalers, distributors, and drug-related products, including analyses of recent court decisions.

PHA 6236—Health Sciences Liability Law (2) Liability of health sciences practitioners, including hospitals, physicians, pharmacists, nurses, medical technologists, and dentists.

PHA 6237—Pharmaceutical Law Seminar (1; max: 2) Selected recent cases and materials having impact on the drug industry, health professions, health-care services, and consumers with respect to the effects of these new decisions on socioeconomics and public health.

PHA 6250—The Patient in the Drug Use Process (3) Examination of psychological theoretical foundations of research on patient's role in health care and drug use. Critique of research evaluation role of patient.

PHA 6251—Drugs in Society (3) Social, economic, and political issues related to U.S. health care system in general and profession of pharmacy in particular. Dynamics of drug use process, illness behavior, and health care utilization examined.

PHA 6252—Prescribing and the Medications Use Process (3) *Prereq: AEE 6767.* Research issues in prescribing and medications use process from perspectives of health professionals: sources of professional information decision making, assessment of quality.

PHA 6254—Reviewing Literature Using Meta-Analysis: Principles, Methods, and Applications (3) *Prereq: STA 6127 or equivalent.* Emphasis on applications, including evaluation of published meta-analyses and conducting a meta-analysis.

PHA 6717—Measurement in Pharmacy Administration Research (3) *Prereq: STA 6200 or equivalent.* Examination of some of the techniques adapted from the social sciences for research in the field of pharmacy administration.

PHA 6937—Topics in Pharmaceutical Administration (2) Analysis of special topics and recent developments in pharmaceutical administration, including innovations in the distribution of drugs and health-care services.

PHILOSOPHY
College of Liberal Arts and Sciences

GRADUATE FACULTY 1993-94

Chairman: J. I. Biro. *Graduate Coordinator:* R. D'Amico. *Graduate Research Professor:* R. M. Hare. *Professors:* R. J. Baum; J. I. Biro; E. S. Haring; J. J. Zeman. *Associate Professors:* T. P. Auxter; R. D'Amico; R. P. Haynes; O. M. Schutte. *Assistant Professor:* K. A. Ludwig; G. Ray.

The Department offers studies leading to the Master of Arts, and Doctor of Philosophy degrees. All applicants for the graduate program must submit with their applications a sample of recent written work in philosophy. Admission to the Master of Arts program requires a bachelor's degree in philosophy or sufficient courses in philosophy. Admission to the Ph. D. program requires completion of an M.A. or its equivalent, as determined by the Department.

All graduate students take foundational courses, in their first four semesters, in the history of philosophy, ethics, analytic philosophy, logic, and continental philosophy. Students who lack preparation in a specific area may need to audit a 3000- or 4000-level course before beginning the required graduate course. Further information about the programs and admissions can be obtained by contacting the Graduate Coordinator, 330 Griffin-Floyd Hall.

PHH 5405—Modern Philosophy I (3) A thorough reading of authors such as Descartes, Spinoza, Locke.

PHH 5406—Modern Philosophy II (3) Major figures such as Leibniz, Berkeley, Hume.

PHH 5505—Studies in Continental Philosophy (3) *Prereq: PHP 5415 or consent of instructor.* Post-Kantian thought, selected themes treated by such thinkers as Schopenhauer, Hegel, Nietzsche, and Sartre.

PHH 6665—Seminar in Latin American Philosophy (3) Themes from the work of major twentieth century Latin American philosophers.

PHI 5136—Logic I (3) Propositional calculus, quantificational logic through completeness, and an introduction to modal logic.

PHI 5365—Epistemology (3) A systematic examination of major theories of knowledge and truth.

PHI 5405—Philosophy of Science (3) Issues involving scientific inquiry, the nature of scientific method, and the differences between natural and social science.

PHI 5456—Philosophy of Social Science (3) Study of issues in philosophy relevant to the social sciences: reduction, covering laws, rational reconstruction, interpretation, and causation.

PHI 5665—Ethical Theory I (3) Meaning and logical character of moral questions, and the thought processes employed in answering them.

PHI 5666—Ethical Theory II (3) Moral reasoning of egoists, utilitarians, deontologists, and contractarians; their accounts tested against current issues.

PHI 5905—Individual Work (1-6; max: 6) *Prereq: approval of instructor, graduate coordinator, and chair.* Problem, author, or topic not treated in available courses.

PHI 5934—Topics in Philosophy (3; max: 6)

PHI 5935—Proseminar (3) Mandatory for entering students. Methods of inquiry and research, illustrated by faculty research projects. S/U.

PHI 6325—Seminar in Philosophy of Mind (3) Topics concerned with mind-body dualism, personal identity and belief.

PHI 6426—Seminar in Epistemology (3) Conceptual connections between theories of knowledge and social, political, and ethical theories; focus on concepts of rationality and relativism.

PHI 6686—Seminar in Theory of Value (3) One or more theories concerning the nature of values and value judgments as relevant to ethics, politics, and social theory.

PHI 6910—Supervised Research (1-5; max: 5) S/U.

PHI 6934—Special Topics (1-4; max: 8).

PHI 6940—Supervised Teaching (1-5; max: 5) S/U.

PHI 6943—Internship in College Teaching (2-4; max: 6) Required for the M.A.T. but available to any students needing additional practice and direction in college-level teaching.

PHI 6971—Research for Master's Thesis (1-9) S/U.

PHI 7979—Advanced Research (1-9) *Prereq: completion of area*

examinations or permission of the graduate committee. Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.

PHI 7980—Research for Doctoral Dissertation (1-12) S/U.

PHM 6645—Seminar in Applied Ethics (3; max: 6) The application of ethics and social theory to practical issues in such areas as health care, law, and business.

PHM 6520—Seminar in Philosophy of Culture (3; max: 6) Philosophical analysis of current problems in critical and cultural studies.

PHP 5005—Ancient Philosophy I (3) Close study of at least three major dialogues.

PHP 5015—Ancient Philosophy II (3) Primary emphasis on categories, posterior analytics, physics, and metaphysics.

PHP 5781—Pragmatism (3) Philosophy in Charles Sanders Peirce, William James, and John Dewey.

PHP 5785—Foundations of Analytic Philosophy (3) Recent British-American philosophy represented in major related writings of such thinkers as Russell, Wittgenstein, Ryle, and Quine.

PHP 6415—Seminar in Kant (3) *Prereq: PHH 5406 or consent of instructor.* Intensive examination of the first Critique and selections from other major works.

PHP 6930—Seminar in a School or Thinker (3; max: 6) The work of one or more, usually pre-twentieth century, thinkers.

PHYSICAL THERAPY
College of Health Related Professions

GRADUATE FACULTY 1993-94

Chairman & Graduate Coordinator: M. A. Clendenin. *Professors:* M. A. Clendenin; M. C. Wroe (*Emeritus*). *Associate Professors:* D. Brunt; J. Carlos; M. C. Finley; N. P. Fisher; A. D. Martin. *Assistant Professor:* M. C. Rader.

The graduate program in physical therapy leading to the Master of Health Science degree is designed for students who have graduated from an accreditted program in physical therapy. Applicants to the program must have a minimum of one year clinical experience in physical therapy. The program emphasizes the scientific basis of clinical practice and is designed to strengthen the physical therapist in the areas of critical analysis of the clinical and basic science literature. Each student is required to perform original research suitable for publication in a refereed journal. The program of study for the Master of Health Science degree requires the completion of a minimum of 32 credit hours. There are 12 hours of core courses plus research. The area of specialization requires at least 12 hours of course work.

Students admitted to the program follow a specialized curriculum in movement dysfunction. The study of human movements is approached from both a biomechanical and a neuropsychological perspective. Emphasis is placed not only on the dynamics of movement but also on how these dynamics are controlled or learned and on how movement organization and performance are changed with pathology. Course sequence and research may be designed for the student whose clinical and research interests are either *musculoskeletal* or *neurorehabilitation.* With the permission of the Graduate Coordinator, the student may follow a course of study more specifically designed for his/her career goals.

PHT 6105C—Joint Morphology (3) A study of the anatomy of joints of the trunk and extremities using cadavers. Lectures on histology of joint tissues and normal and abnormal joint changes in the life cycle.

PHT 6125—Concepts in Clinical Biomechanics (3) *Prereq: PHT 6105C.* Analysis of joint biomechanics and forces acting on those joints during human motion. Description of their relationship to injury and rehabilitation.

PHT 6137C—Advanced Musculoskeletal Concepts for Physical Therapy (4) Advanced physiology, pathophysiology, evaluation, and treatment of musculoskeletal disorders.

PHT 6166C—Applied Neuroanatomy for Physical Therapy (3) Neuroanatomy emphasizing motor and sensory pathways. Emphasis on special sensory systems and normal rather than abnormal mechanisms.

PHT 6167C—Applied Neurophysiology for Physical Therapy (3) *Prereq: PHT 6166C.* Neurophysiological basis of movement, posture, sensation, and special sensory systems with functional application to physical therapy evaluation and treatment.

PHT 6236C—Neurological Dysfunction as Applied to Physical Therapy (4) Advanced peripheral and central nervous system neurology, evaluation, and therapeutic methods for neurological dysfunction.

PHT 6615—Research Instrumentation in Physical Therapy (2) Current theory and practical application of techniques for the understanding and design of research projects related to physical therapy.

PHT 6915—Applied Research in Physical Therapy (1-8; max: 12) *Prereq: PHT 6615 and STA 6200.* Independent study of students' selected research topic under supervision of graduate adviser. S/U.

PHT 6935—Seminar in Physical Therapy I (1; max: 4) *Prereq: consent of instructor.* Current topics in physical therapy. S/U.

PHT 6949—Advanced Internship in Physical Therapy (6-12; max: 12) *Prereq: completion of didactic course work in the advanced program in physical therapy.* Clinical experiences in physical therapy facilities selected to meet the individual needs and interests of each student. S/U.

PHT 6xxx—Behavioral and Neural Basis for Movement Dysfunction (3) Planning, programming, and execution of movement. Theoretical and anatomical relationships explored. Behavioral research used as instrument to investigate movement organization and dysfunction.

PHYSICS
College of Liberal Arts and Sciences

GRADUATE FACULTY 1993-94

Chairman: N. S. Sullivan. *Graduate Coordinator:* J. M. Yelton. *Graduate Research Professors:* E. R. Andrew; P. O. Löwdin (*Emeritus*). *Professors:* E. D. Adams; T. L. Bailey (*Emeritus*); A. A. Broyles (*Emeritus*); J. R. Buchler; S. L. Detweiler; J. W. Dufty; F. E. Dunnam; R. D. Field; R. E. Garrett (Emeritus); C. F. Hooper; G. G. Ihas; J. R. Ipser; J. R. Klauder; P. Kumar; D. A. Micha; H. J. Monkhorst; N. Y. Ohrn; L. R. Peterson; P. Ramond; J. R. Sabin; P. Sikivie; G. R. Stewart; N. S. Sullivan; D. B. Tanner; C. B. Thorn; S. B. Trickey; H. A. Van Rinsvelt; J. K. Walker. *Associate Professors:* P. R. Avery; J. N. Fry; M. W. Meisel; K. A. Muttalib; S. E. Nagler; L. E. Seiberling; C. J. Stanton; Y. Takano; B. S. Thomas (*Emeritus*); B. Whiting; J. M. Yelton. *Assistant Professors:* A. W. Cumming; S. Hershfield; P. J. Hirschfeld; J. K. Ingersent; Z. Qiu; R. Woodard.

The Department of Physics offers the Master of Science (thesis or nonthesis) and the Doctor of Philosophy degrees. The nonthesis Master of Science in Teaching is also offered.

Specific areas of specialization for graduate research include astrophysics and cosmology, atomic and molecular physics, chemical physics, condensed matter physics (theory and experiment), nuclear physics, particle physics (theory and experiment), statistical physics, and low temperature physics. Special interdisciplinary research programs include the Institute for Fundamental Theory (carried out jointly with the Department of Mathematics), the Institute for Theoretical and Computational Studies in Molecular and Materials Science (carried out jointly with the Department of Chemistry) and Microfabritech (jointly with the College of Engineering). A curriculum is offered by the Center for Chemical Physics for students interested in research related to chemistry or chemical engineering. The Center for Ultra Low Temperature Research provides opportunities for investigations in low temperature physics, including use of the new Microkelvin Research Laboratory. The National High Magnetic Field Laboratory recently awarded to the University of Florida, Florida State University, and Los Alamos is expected to be operating in 1993.

The core curriculum is designed to provide a thorough foundation for all physics graduate students. It consists of PHY 6246, 6346, 6347, 6536, 6645, and 6646. Doctoral students ordinarily take comprehensive examinations (which are based on the four fundamental areas included in the core curriculum) at the beginning of their second year. Master's degree candidates must take more than 12 semester hours numbered 6000 or above, usually from the core curriculum.

All degree candidates are required, as part of their graduate education, to participate continuously in the research and/or teaching programs of the Department.

PHY 5720C—Electronics I (3) *Prereq: PHY 3321.* Experiments involving solid-state devices, amplifiers, integrated circuits, and digital logic.

PHY 5905—Individual Work (2-4; max: 12 including PHY 6905) *Prereq: permission of instructor.* Assigned reading and problems program, special topics, or development of special experimental or theoretical problems. Work selected according to student's needs and interests.

PHY 6246—Classical Mechanics (3) Review of Lagrangian formulation and special relativity. Hamiltonian mechanics, canonical transforms and Hamilton-Jacobi theories, action angle variables, rigid rotators, normal modes, mechanics of continuous media. Fluid mechanics.

PHY 6346—Electromagnetic Theory I (3) Electrostatics, special function expansions, magnetostatics, linear media, time dependent Maxwell theory, wave propagation and dispersion, diffraction, scattering, radiation, relativistic covariance, applications.

PHY 6347—Electromagnetic Theory II (3) *Prereq: PHY 6346.* Continuation of PHY 6346.

PHY 6536—Statistical Mechanics I (3) *Prereq: PHY 6645 and 6246.* Equilibrium ensembles for classical and quantum systems, fluctuations, applications to normal fluids, phase transitions and critical phenomena, plasmas.

PHY 6537—Statistical Mechanics II (3) *Prereq: PHY 6536.* Nonequilibrium ensembles, linear response, time correlation functions, Green's functions, broken symmetries and quantum fluids, Fokker-Planck models and dynamical transitions.

PHY 6556—Low Temperature Physics (3) *Prereq: PHY 6645.* Techniques for establishing and measuring low temperatures. Experimental and theoretical aspects of quantum fluids and solids and of superconductivity.

PHY 6645—Quantum Mechanics I (3) *Prereq: MAS 5156, MAP 5304, PHY 4605.* Hilbert space, Heisenberg and Schrodinger dynamics, invariance properties and symmetry operations, spin, perturbation, and variational methods.

PHY 6646—Quantum Mechanics II (3) *Prereq: PHY 6645.* Time dependent perturbation theory, scattering theory, identical particles and second quantization, Dirac equation.

PHY 6648—Quantum Field Theory I (3) *Prereq: PHY 6646.* The Poincare group; the Dirac equation; quantization of free fields; the scattering matrix; applications.

PHY 6905—Individual Work (2-4; max: 12 including PHY 5905) Treatment of an experimental or theoretical problem or topic assigned on the basis of student's needs and interests.

PHY 6910—Supervised Research (1-5; max: 5) S/U.

PHY 6920—Departmental Colloquium (1; max: 14) Summary presentation of contemporary topics by visiting and local researchers. S/U.

PHY 6935—Seminar in Modern Physics (1; max: 12) Presentation, review, and commentary on recent developments in physics research. S/U.

PHY 6940—Supervised Teaching (1-5; max: 5) S/U.

PHY 6943—Internship in College Teaching (2,4,6; max: 6) *Prereq: graduate standing.* Required for Master of Science in Teaching students, but available for students needing additional practice and direction in college-level teaching.

PHY 6971—Research for Master's Thesis (1-15) S/U.

PHY 7097—Advanced Topics in Theoretical Physics (3; max: 10) Special studies in mathematical methods and applications of current interest at the forefront of one or more specialities in theoretical physics.

PHY 7098—Advanced Topics in Experimental Physics (3; max: 10) Special studies in experimental methods, instrumentation, and data analysis of current interest at the forefront of one or more specialties in experimental physics.

PHY 7669—Quantum Field Theory II (3) *Prereq: PHY 6648.* Path integral quantization; perturbation theory; renormalization; quantization of gauge fields; applications.

PHY 7939—Special Topics (2; max: 12) Assigned reading program, seminar, or lecture series in a rapidly advancing specialty of physics.

PHY 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.

PHY 7980—Research for Doctoral Dissertation (1-15) S/U.

PHZ 5315—Introduction to Nuclear Astrophysics (3) *Prereq: consent of instructor.* Topics include nucleosynthesis, cosmic ray interactions, explosive hydrogen burning, and the current state of experimental nuclear astrophysics.

PHZ 5354—Introduction to Particle Physics (3) *Prereq: permission of instructor.* Descriptive survey of particle phenomena and states; conserved quantities and quantum numbers, invariance principles.

PHZ 5405—Introduction to Solid-State Physics (3) *Prereq: PHY 4605 or permission of instructor.* Descriptive survey of solid-state phenomena and basic methods. Crystal structure, lattice modes, electronic states, thermal, optical, and magnetic properties.

PHZ 5715—Introduction to Biophysics (3) Physical principles and methodologies applied in biology. Receptor design and transduction mechanisms in sensory processes; biocrystallography and intermolecular associations of biomolecules; mechanisms of motility from molecular to macroscopic levels; aspects of biomembrane structure and function; photobiology; water in molecular biology.

PHZ 6156—Computer Methods in Physics (2) *Prereq: elementary FORTRAN.* Numerical techniques useful in the solution of physical problems. Appropriate utilization of computation; aspects of contemporary methods in computational physics, especially advanced version of FORTRAN.

PHZ 6225—Quantum Theory of Matter I (3) *Prereq: PHY 4605 or CHM 6470.* Application of quantum mechanics to electronic

structure of atoms, molecules, and solids; Hartree-Fock, semi-empirical, and local density schemes, computational methods. Correlation problem, density matrices, modern many-body perturbation theory.

PHZ 6247—Chemical Physics (3) *Prereq: PHY 6645 or permission of instructor. Identical to CHM 6520.* Intermolecular forces, molecular dynamics; electromagnetic properties of molecular systems; solid surfaces; theoretical and computation methods.

PHZ 6326—Nuclear Physics (3) *Prereq: PHY 6645.* Nuclear systematics. Independent particle model of nucleus, velocity-dependent potentials, resonances, doorway states, direct reactions, nuclear forces, and nuclear structure.

PHZ 6355—Elementary Particle Physics I (3) *Prereq: PHY 6646.* Dirac and Klein-Gordon equations, Feynman diagrams, scattering amplitudes; the standard model of weak, electromagnetic, and strong interactions; phenomenology of high energy physics.

PHZ 6391—Seminar in Astrophysics (1; max: 12) S/U.

PHZ 6392—Seminar in Particle Physics (1; max: 12) S/U.

PHZ 6426—Solid State I (3) *Prereq: PHY 6536.* Quantum theory of crystalline solids: Bloch theorem, electronic structure, thermodynamic and transport properties of metals, lattice dynamics, electronic interactions in solids, semiconductors and insulators.

PHZ 6493—Seminar in Condensed Matter Physics (1; max: 12) S/U.

PHZ 6607—Special and General Relativity (3) *Prereq: PHY 6246.* Special relativity, tensor analysis, covariant electromagnetism and hydrodynamics; general relativity, Riemannian geometry, gravity as curvature, exact solutions; relativistic astrophysics, cosmology.

PHZ 7226—Quantum Theory of Matter II (3) *Prereq: PHZ 6225.* Continuation of PHZ 6225.

PHZ 7357—Elementary Particle Physics II (3) *Prereq: PHZ 6355.* Continuation of PHZ 6355. Extensions of the standard model. Calculations of QCD corrections.

PHZ 7427—Solid State II (3) *Prereq: PHZ 6426.* Many body theory: Green's functions, Feynman diagrams, linear response theory. Electron-phonon interactions, superconductivity, magnetism, conductivity of metals.

PHZ 7428—Theoretical Condensed Matter Physics (3) *Prereq: PHY 6536.* Advanced current topics in statistical mechanics and many-body physics, specialized theoretical and computational techniques.

AST 6416—Cosmology (3) *Prereq: PHZ 6606.* Isotropic and homogeneous cosmologies; measurements in cosmology; thermal history of the universe; the microwave background; galaxy formation; the inflationary universe.

PHYSIOLOGY
College of Medicine

GRADUATE FACULTY 1993-94

Chairman: M. I. Phillips. *Graduate Coordinator:* B. R. Stevens. *Graduate Research Professor:* M. J. Fregly. *Suncoast Chapter of American Heart Association Professor of Cardiovascular Research:* L. Belardinelli. *Professors:* P. A. V. Anderson; D. H. Barron; J. R. Cade; S. Cassin; E. M. Copeland; W. W. Dawson; W. Drummond; G. A. Gerencser; M. J. Jaeger; P. Kalro; P. Kosch; A. B. Otis; M. I. Phillips; M. L. Pollock; P. Posner; S. K. Powers; M. K. Raizada; W. N. Stainsby; C. Sumners; C. E. Wood. *Associate Professors:* P. W. Davenport; M. Keller-Wood; W. Nichols; B. R. Stevens; C. S. Wingo; C. E. Wood.

The Department of Physiology offers a program leading to the degree of Doctor of Philosophy in the medical sciences with specialization in physiology.

Areas of specialization within the Department of Physiology include cell physiology, sensory physiology, general endocrinology, neuroendocrinology, neurophysiology, respiration, circulation, physiology of muscle, environmental physiology, cardiac electrophysiology, membrane transport, and neonatal physiology.

Undergraduate majors appropriate as foundations for the study of physiology are biology, chemistry, engineering, mathematics, or physics. The following courses are especially useful as a background for the study of physiology: general biology, vertebrate biology, general chemistry, analytical chemistry, organic chemistry, physical chemistry, general physics, calculus, and statistics. Students may find it necessary to remedy deficiencies in their background by taking undergraduate courses after admission to Graduate School.

BMS 6562—Pathophysiology (3) Introduction into basic mechanisms of disease states with emphasis on the cardiovascular, respiratory, renal, and gastrointestinal systems.

GMS 5400C—Principles of Physiology (6) *Prereq: BSC 3088 or equivalent.* Physiology of mammalian organ systems, with special reference to the human.

GMS 5400L—Laboratory in Physiology (2) *Coreq: GMS 5400C.* Laboratory course designed to illustrate the principles of physiology. Student exercises coordinated with topics under discussion in GMS 5400C.

GMS 5403—Advanced Endocrinology (4) *Prereq: GMS 5400C or equivalent, consent of instructor.* Readings, discussion, and lectures on recent advances in endocrinology. This course is taught every other year.

GMS 5421—Vision (3) *Prereq: consent of instructor.* Introduction to methodology, anatomy, and function of vision.

GMS 6402—Physiology of Respiration (2) Gas exchange in lungs and tissues. Ventilatory mechanics. Fluid mechanics of gas flow in airways. Comparative physiology of respiratory mechanisms.

GMS 6409—Body Temperature Regulation (2) Neural and endocrine aspects of temperature regulations, hypo- and hyperthermia, adaptation to cold and heat, hibernation.

GMS 6410—Physiology of the Circulation of Blood (2) Physiology of the component parts of the circulation, relation of structure and function, emphasis on control mechanisms.

GMS 6430—Cell Physiology (3) *Prereq: GMS 5400C, consent of instructor.* Introduction to cellular physiology of the eukaryotic cell.

GMS 6432—Membrane Transport Physiology (2) Cell membrane transport of ions, glucose, amino acids, and drugs.

GMS 6450C—Marine Physiology (2) *Prereq: GMS 5400C, consent of instructor.* Taught at Whitney Labs.

GMS 6460—Catecholamines in Physiological Control (2) *Prereq: GMS 5400C or equivalent, consent of instructor.* Lectures in all aspects of catecholamine physiology and pharmacology.

GMS 6475—Neonatal Physiology (2) Physiological regulation in newborn mammals.

GMS 6479—Gastrointestinal Physiology (2) Physiology of the vertebrate salivary glands, stomach, small and large intestine, pancreas, liver, and the muscular movements of the gastrointestinal system.

GMS 6490C—Research Methods in Physiology (2-4; max: 6) Special needs of each student are met by conferences and laboratory work. S/U.

GMS 6495—Seminar in Physiology (1; max: 12) S/U.

GMS 6496—Recent Advances in Physiology (2; max: 10) Content varies from year to year.

GMS 6497—Seminar on Vision (3) Current research and theory on visual function. Literature survey and design of an experiment relevant to recent theory.

GMS 6498—History of Physiology (2) *Prereq: consent of instructor.* The development of physiological knowledge and concepts. Readings, lectures, and discussion.

GMS 6499—Renal Physiology (2) Seminars on the comparative physiology, aspects of renal structure and function.
GMS 6933—Sensory Science Seminar (1) Results of current investigations in sense organ function. S/U.
GMS 7413—Basic Cardiac Electrophysiology (2) Study of the normal electrophysiology and ionic mechanisms involved in various regions of the heart.
GMS 7419—Electrophysiological Basis of Cardiac Dysrhythmias (2) Study of normal cardiac cellular electrophysiology and changes which result in cardiac dysrhythmias. New techniques in diagnosis and management.

PLANT MOLECULAR AND CELLULAR BIOLOGY
Colleges of Agriculture, and Liberal Arts and Sciences

GRADUATE FACULTY 1993-94

Director: W. B. Gurley. *Graduate Coordinator:* C. D. Chase. *Graduate Research Professor:* R. R. Schmidt; I. K. Vasil. *Professors:* P. S. Chourey; R. J. Ferl; L. C. Hannah; K. E. Koch; G. A. Moore; D. R. Pring; R. L. Smith. *Associate Professors:* C. D. Chase; K. C. Cline; D. W. Gabriel; W. B. Gurley; C. L. Guy; H. C. Kistler; D. R. McCarty; C. E. Vallejos. *Assistant Professors:* J. M. Davis; A. C. Harmon.

The interdepartmental program in Plant Molecular and Cellular Biology offers the Master of Science and Doctor of Philosophy degrees with specialization in plant molecular genetics, biochemistry, molecular biology, cell biology, pathology, and physiology. Faculty participating in this degree program are drawn from seven departments—Agronomy, Botany, Environmental Horticulture, Forestry, Horticultural Sciences, Microbiology and Cell Science, and Plant Pathology—in two colleges. Specific areas of research include biochemical genetics; cytoplasmic/nuclear interactions; physiological genetics; regulation of gene expression; metabolism, growth, and development; genome mapping; host/pathogen interactions; organelle import; signal transduction; cell and tissue culture; and plant biotechnology.

Applicants should have a strong undergraduate background in biological sciences, biochemistry, calculus, chemistry through organic, physics, and genetics. Deficiencies may be made up during the first year of graduate study. All students are required to take four core courses which include BCH 6206; BCH 6740; BCH 6415 or GMS 6152; and HOS 6231or PCB 5065. Additional courses are tailored to the student's interest and are drawn from over 50 electives taught by departments in the Colleges of Agriculture, Medicine, and Liberal Arts and Sciences.

In order to provide exposure to a variety of faculty and experimental systems, new students are encouraged to rotate among three laboratories during the first six months of enrollment before selection of a dissertation research area and supervisory committee. For additional information, write to the Graduate Coordinator, Plant Molecular and Cellular Biology, P. O. Box 110692, IFAS.

PCB 5065—Principles of Genetics (3) *Prereq: AGR 3303 or PCB 3063 or equivalent.* Basic and advanced principles taught through presentation of classical and current literature. Characterization, regulation, and mutation of genes, transmission, recombination and linkage, extranuclear, developmental, quantitative, and population genetics. Offered fall semester.
PCB 6910—Supervised Research (1-5; max: 5) S/U.
PCB 6937—Special Topics in Plant Molecular and Cellular Biology (1-4; max: 8) *Prereq: graduate course work in genetics, biochemistry, or molecular biology areas.* Contemporary research.
PCB 6971—Research for Master's Thesis (1-15) S/U.
PCB 7922—Journal Colloquy in Plant Molecular and Cellular Biology (1;max:8) *Required for PCMB majors.* Critical discussion and presentation of recent journal articles in area of plant molecular and cellular biology.
PCB 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.
PCB 7980—Research for Doctoral Dissertation (1-15) S/U.

PLANT PATHOLOGY
College of Agriculture

GRADUATE FACULTY 1993-94

Chairman: G. N. Agrios. *Graduate Coordinator:* F. W. Zettler. *Eminent Scholar:* W. O. Dawson. *Professors:* G. N. Agrios; R. D. Berger; R. H. Brlansky; G. E. Brown; R. Charudattan; A. R. Chase; P. S. Chourey; M. J. Davis; K. Derrick; W. J. French; S. M. Garnsey; E. Hiebert; D. L. Hopkins; J. B. Jones; J. P. Jones; J. W. Kimbrough; T. A. Kucharek; R. F. Lee; D. J. Mitchell; C. L. Niblett; K. L. Pohronezny; D. R. Pring; D. E. Purcifull; D. A. Roberts; R. A. Schmidt; F. M. Shokes; R. M. Sonoda; R. E. Stall; J. O. Strandberg; L. W. Timmer; F. W. Zettler. *Associate Professors:* J. A. Bartz; G. M. Blakeslee; D. W. Gabriel; T. R. Gottwald; N. A. Harrison; H. C. Kistler; F. N. Martin; R. T. McMillan; J. W. Miller; R. C. Ploetz; R. N. Raid; F. M. Shokes; G. W. Simone; D. P. Weingartner. *Assistant Professors:* E. L. Barnard; D. O. Chellemi; L. E. Datnoff; R. J. McGovern; J. J. McRitchie; J. E. Polston; C. A. Powell.

The Department of Plant Pathology offers graduate studies leading to the Master of Agriculture, Master of Science, and Doctor of Philosophy degrees. A superior student with a baccalaureate degree may begin graduate study toward a higher degree in the basic areas of plant pathology. These areas include molecular and biochemical aspects of host-pathogen systems, biological control of pathogens and weeds, epidemiology, etiology, genetics of host-pathogen systems, soil microbiology, and pathogen taxonomy. In Florida, the diversity of cropping sequences, coupled with an environment ideal for plant disease development, is unexcelled and offers the student opportunities to study diseases of unique crops as well as diseases of crops of national and international importance. Intimate knowledge can be gained of diseases of field, forage, fruit, ornamental, pasture, range, turf, and vegetable crops in temperate, subtropical, and tropical environments. Students who anticipate study in plant pathology at the University of Florida should include in their undergraduate programs training in botany (anatomy, cytology, physiology, systematics), chemistry (through biochemistry), genetics, microbiology, physics, zoology, and mathematics.

The Department of Entomology and Nematology offers courses in nematology.

PLP 5053—Tropical Plant Pathology (3) *Prereq: PLP 3002.* Importance, etiology, and management of diseases and field observations of tropical diseases. Offered spring semester in odd-numbered years.

PLP 5102—Theory and Practice of Plant Disease Control (3) *Prereq: PLP 3002 or equivalent.* Plant disease control: concepts, strategies, methods, restrictions, health and environmental concerns, future. Offered spring semester in odd-numbered years.

PLP 5115C—Citrus Pathology (3) *Prereq: PLP 3002C.* Symptoms, disease cycles, and control measures for major citrus diseases; emphasis on diagnosis using biological, chemical, and biochemical techniques. Offered at CREC, Lake Alfred, fall semester in even-numbered years.

PLP 5656C—Mycology (4) *Prereq: BOT 2011, 3303, or PLP 3002.* Morphology, development, and taxonomy of fungi with field and laboratory exercises emphasizing the ecology and economic importance. Offered fall semester of even-numbered years.

PLP 6223C—Plant Virology (3) Principles of plant virology; symptomatology, transmission, insect vector relationships, properties of viruses, purification, electron microscopy, morphology, serology, and control of viral diseases. Offered fall semester of odd-numbered years.

PLP 6241C—Bacterial Plant Pathogens (3) *Prereq: PLP 3002, MCB 3020.* Relationships of bacterial plant pathogens and interactions with their hosts. Offered spring semester in even-numbered years.

PLP 6262C—Fungal Plant Pathogens (4) *Prereq: PLP 5656C.* History, ecology, genetics, physiology, taxonomy, and management of plant pathogenic fungi. Offered fall semester of odd-numbered years.

PLP 6281—Field Plant Pathology (2) *Prereq: PLP 3002 or equivalent.* Examination of Florida plant diseases, with field trips to observe the predominant diseases of economic crops in most agricultural production areas. Offered spring semester in odd-numbered years.

PLP 6291—Plant Disease Diagnosis (2) *Prereq: PLP 3002, 5656C.* Methods used in diagnosing plant diseases caused by fungi, bacteria, viruses, and abiotic conditions. Offered fall semesters.

PLP 6303—Molecular Plant Pathology (2) *Prereq: AGR 3303, BCH 4024, or equivalents.* Molecular biology of host-parasite interactions and biochemical mechanisms of pathogenesis. Offered spring semester in even-numbered years.

PLP 6303L—Molecular Plant Pathology Laboratory (2) *Prereq: one course each in biochemistry and plant physiology.* Methods in molecular plant pathology. Offered spring semester in even-numbered years.

PLP 6404—Epidemiology of Plant Disease (4) *Prereq: PLP 3002.* Principles of ecology of plant diseases with emphasis on the effects of the climatic environment on the development of disease in populations of plants and the implications with regard to the strategy of disease control. Offered spring semester in odd-numbered years.

PLP 6502—Genetics of Host-Parasite Interactions (4) *Prereq: PLP 3002 and one course each in biochemistry and genetics.* Mechanisms of genetic variability and the genetic interaction of parasite and host with respect to plant disease resistance. Offered spring semester in even-numbered years.

PLP 6657C—Biology and Taxonomy of Aquatic and Other Lower Fungi (3) *Prereq: PLP 5656C or equivalent.* Structure, development, and taxonomy of zoosporic and zygosporic fungi. Offered summer A in odd-numbered years.

PLP 6658C—Biology and Taxonomy of the Basidiomycetes (3) *Prereq: PLP 5656C or equivalent.* Isolation, collection, and identification of field material required. Offered summer B in odd-numbered years.

PLP 6659C—Biology and Taxonomy of Ascomycetes and Their Anamorphic States (3) *Prereq: PLP 5656C or equivalent.* Collection, isolation, and identification. Offered summer C in even-numbered years.

PLP 6905—Problems in Plant Pathology (1-4; max: 6) Study of any field of plant pathology including diseases of all major crop groups. H.

PLP 6910—Supervised Research (1-5; max: 5) S/U.

PLP 6921—Colloquium in Principles of Plant Pathology (1; max: 4)

PLP 6932—Seminar in Plant Pathology (1; max: 4) Discussion of the literature, techniques, and research pertaining to plant pathology. S/U.

PLP 6940—Supervised Teaching (1-5; max: 5) S/U.

PLP 6971—Research for Master's Thesis (1-15) S/U.

PLP 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.

PLP 7980—Research for Doctoral Dissertation (1-15) S/U.

POLITICAL SCIENCE
College of Liberal Arts and Sciences

GRADUATE FACULTY 1993-94

Chairman: K. D. Wald. *Graduate Coordinator:* M. D. Martinez. *Professors:* J. W. Button; A. B. Clubok; M. M. Conway; W. L. Francis; G. S. Hyden; K. R. Legg; R. Lemarchand; T. L. McCoy; W. A. Rosenbaum; S. E. Sanderson; J. W. Spanier; B. E. Swanson; K. D. Wald. *Associate Professors:* S. C. Craig; A. J. Damico; D. M. Hedge; W. A. Kelso; M. D. Martinez; A. R. Matheny; J. F. Morrison; R. K. Scher; M. J. Scicchitano; P. J. Williams. *Assistant Professors:* M. L. Brown; G. D. Goertz.

The Department of Political Science offers two degree programs, political science and political science—international relations. Three degrees are offered in each program: Master of Arts in Teaching (nonthesis), Master of Arts (thesis or nonthesis option), and Doctor of Philosophy.

Admission to graduate study in the Department of Political Science normally requires the completion of an undergraduate major in political science or its equivalent. Students without this preparation will be required to make up deficiencies early in their graduate work. All degree programs, except for the special programs emphasizing public administration and political campaigning, require evidence of a year of satisfactory work in an approved foreign language.

Admission to the programs offered in the Department is normally restricted to the fall semester.

The areas of specialization offered by the Department for the Ph.D., M.A., and M.A.T. include American government and politics, comparative politics, international relations, public administration, political theory and political behavior. In addition, the Department's offerings include work taken in cooperation with the Center for African Studies and with the Center for Latin American Studies. Programs composed for these areas can be used to prepare students for careers in teaching, research, and government service. The Department also offers specialized M.A. curricula in political science emphasizing public administration, political campaigning, and international development policy and administration.

Ph.D. students are required to offer a major field of study and two minor fields. Qualifying examinations must be completed in the major field of study. The other minor field of study may be completed through course work. All Ph.D. students are requried to complete a number of core seminars.

International Relations is a field of specialization that may be pursued either as part of the regular degree programs in political science or through an interdisciplinary political science—international relations degree program. The political science—international relations degree is designed to provide professional education to those whose primary interest is a career in foreign relations, whether in the public or private sector. Requirements for the M.A. are an interdisciplinary core of 12 credits and 27 credits in three discipline-based tracks. Two of the three tracks must be in political science, while the third may be chosen from a wide range of other disciplines, including economics, journalism, agriculture, statistics, area studies, and computer sciences. Students in this M.A. program select the nonthesis option. For the Ph.D., the student must complete the requirements for the M.A. and then has the option of taking (1) either three fields in political science or (2) two fields in political science and a third in another discipline.

Public Administration.—The curriculum consists of seminars in political science, public administration, and research methods, and recommended courses in accounting, economics, management, urban planning, and public works engineering. Supervised internships in selected agencies in Florida are arranged by the Department of Political Science as an integral part of the training program. This specialization requires 36 hours of course work plus satisfactory completion of a 3-hour internship at the discretion of the Department. There is no foreign language requirement. Students in this specialization select the nonthesis option in political science. In addition to the M.A. degree in political science, students receive the *Certificate in Public Administration.*

Political Campaigning.—Students take a total of 36 hours from four major areas: (1) the core courses required of all M.A. students, (2) courses oriented to practical aspects of political campaigning, (3) courses which place campaigning in the broader context of American politics, and (4) related courses offered by the College of Journalism and Communications. In addition to the 36 hours of course work, students must complete a campaign-related internship and pass a comprehensive examination. Students in this specialization select the nonthesis option and no foreign language is required. In addition to the M.A. degree in political science, students receive the *Certificate in Political Campaigning.*

Law/Public Administration Joint Degree Program.—A four-year program leading to a Juris Doctor and a Master of Arts in political science (public administration) is offered under the joint auspices of the College of Liberal Arts and Sciences' Department of Political Science and the College of Law. The program provides students interested in law and public service with the opportunity to blend relevant work in public administration, political science, and law. Students must meet the entrance requirements of both the College of Law and the graduate program in political science (public administration). A thesis is not required. Interested students should apply to both the Holland Law Center and to the Graduate School, noting on the application the joint nature of their admission request. Admission to the two degree programs must be simultaneous. Further information on the program is available from the Holland Law Center and from the Department of Political Science.

For further information and detailed requirements, prospective students are invited to write for the department brochure on graduate programs in political science.

CPO 5935—Advanced Topics in Comparative Politics (3; max: 6) *Prereq: consent of the department .*

CPO 6036—Politics in Developing Societies (3) Comparative analysis of political and administrative problems confronting less developed political systems.

CPO 6046—Politics in Advanced Industrial Societies (3) Comparative analysis of typical political, economic, and social problems confronting governments of advanced industrial states.

CPO 6091—Introduction to Comparative Political Analysis (3) Introduction to major theoretical and methodological approach to study of comparative politics.

CPO 6206—Seminar in African Politics (3) Study of African politics in comparative perspective.

CPO 6307—Latin American Politics I (3) *Prereq: knowledge of Spanish or Portuguese; French may be substituted with consent of instructor.*

CPO 6511—Seminar in East Asian Politics (3) *Prereq: CPO 6091.* Comparison of politics and political behavior in Chinese People's Republic and Japan.

CPO 6936—Advanced Seminar in Comparative Politics (3) *Prereq: CPO 6091.* Examination of major contemporary orientations and themes in comparative politics.

INR 5935—Advanced Topics in International Relations (3; max: 6) *Prereq: consent of the department.*

INR 6039—International Political Economy (3)

INR 6208—Advanced International Relations Theory (3)

INR 6305—Politics of American Foreign Policy Making (3) Interaction between foreign policy and domestic political variables.

INR 6337—Politics of National Security Policy (3)

INR 6607—International Relations Theory (3) Basic forces, problems, and developments in international politics and organization.

PAD 5935—Advanced Topics in Public Administration (3; max: 6) *Prereq: consent of the department.*

PAD 6108—Public Administration Theory (3) Public administration, with emphasis on the units of analysis and contributions of each approach to general understanding of the field.

PAD 6136—Contemporary Public Administration (3)

PAD 6227—Public Budgeting and Finance (3) Decision making; budget planning and formulation.

PAD 6865 Development Administration (3) *Prereq: consent of instructor.* Public administration practices in developing societies.

PAD 6946—Internship in Government (3) *Prereq: consent of department.* S/U.

POS 5932—Special Topics (3; max: 6)

POS 5935—Advanced Topics in Political Science (3; max: 6) *Prereq: consent of the department.*

POS 6045—Seminar in American Politics (3) Introduction to major conceptual approaches to the American political system and to the history of the study of American politics.

POS 6076—Social Structures and Political Power (3)

POS 6127—State Government and Politics (3) The bibliography, methodology, and research topics of American state and local governments.

POS 6146—Urban Politics (3) Exploration of processes, actors, and institutions in local U.S. politics, along with a brief look at significant issue areas including fiscal crisis, racial conflict, and education.

POS 6157—Community Analysis (3) Development of social, economic, and political profiles in understanding the trends, projections, and public policy alternatives.

POS 6207—Political Behavior (3) Consideration of participation, political culture, and public opinion including classic and current research.

POS 6208—Political Behavior Research (3) *Prereq: POS 6207 or permission of instructor.* Application of scientific research techniques to analysis of political behavior.

POS 6247—Seminar in Political Socialization and Political Cognition (3) Review of literature on political socialization, social influence, personality, and political cognition.

POS 6427—Legislative Process (3) Examination of role of legislative institutions in American government.

POS 6453—Political Parties and Interest Groups (3) Examination of structure and functions of political parties and interest groups in the United States.

POS 6714—Research Seminar in American Politics (3) *Prereq: POS 6045 or equivalent.* Application of research techniques to study of American political institutions and politics.
POS 6736—The Conduct of Inquiry (3) Empirical research methodology in political science.
POS 6747—Topics in Political Research Methodology (3) Review of recent applications of advanced research methods to different types of political science data.
POS 6757—Survey Research (3) Methods of survey research in context of field investigation. Formulation of research hypotheses; construction of measuring instruments, collection, analysis of data.
POS 6905—Individual Work (1-4; max: 12)
POS 6910—Supervised Research (1-5; max: 5) S/U.
POS 6927—Practicum in Applied Political Science (3)
POS 6933—Special Topics (1-3; max: 6)
POS 6940—Supervised Teaching (1-5; max: 5) S/U.
POS 6943—Internship in College Teaching (2,4,6; max: 6) Required for Master of Arts in Teaching candidates but available for students needing additional practice and direction in college-level teaching.
POS 6971—Research for Master's Thesis (1-15) S/U.
POS 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.
POS 7980—Research for Doctoral Dissertation (1-15) S/U.
POT 5935—Advanced Topics in Political Theory (3; max: 6) *Prereq: consent of department.*
POT 6067—Contemporary Political Theory (3)
POT 6314—Democratic Theory (3)
POT 6506—Values and Administration (3)
PUP 5935: Advanced Topics in Public Policy (3; max: 6) *Prereq: consent of the department.*
PUP 6006—Policy Process (3) General examination of public policy formulation and implementation. Special emphasis upon political and economic determinants and relationship to social theory.
PUP 6007—Policy Evaluation (3) An examination of methodologies appropriate to the analysis of public policies.
PUP 6015—Comparative Policy Analysis (3) Examination of various approaches to policy analysis in comparative perspective.
PUP 6934—Topics in Public Policy (3; max: 6) Topics in various policy fields, such as health politics and policy, regulatory policy, environmental policy, politics of equality, etc.

POULTRY SCIENCE
College of Agriculture

GRADUATE FACULTY 1993-94

Chairman: R. P. Natzke. *Graduate Coordinator:* R. D. Miles. *Graduate Research Professor:* R. H. Harms. *Professors:* B. L. Damron; J. L. Fry; R. D. Miles; H. R. Wilson. *Associate Professors:* F. B. Mather; M. D. Ouart; D. R. Sloan.

The Department of Poultry Science offers major work for the degrees of Master of Agriculture and Master of Science. Programs leading to the Doctor of Philosophy degree, with emphasis on problems related to poultry science, may be obtained through the Department of Animal Science or Department of Food Science and Human Nutrition, with faculty members from the Department of Poultry Science directing the program.

Areas of specialization for both master's and Ph.D. degrees are management, nutrition, physiology, and poultry products technology.

A departmental prerequisite for admission to graduate study is a sound background in the biological sciences.

The following courses in related areas are acceptable for graduate credit as part of the candidate's major: ANS 6636—Meat Technology; ANS 6288—Experimental Techniques and Analytical Procedures in Meat Research; ANS 6751—Physiology of Reproduction; ANS 5446—Animal Nutrition; ANS 6458—Advanced Methods in Nutrition Technology; ANS 6472—Vitamins; ANS 6723—Mineral Nutrition and Metabolism; ANS 6721—Swine Nutrition; DAS 6531—Endocrinology; DAS 6555—Environmental Physiology of Domestic Animals; FOS 6226—Advanced Food Microbiology; FOS 6315C—Advanced Food Chemistry; FOS 6428C—Advanced Food Processing; FOS 6726—Psychophysical Aspects of Foods; HUN 6245—Advanced Human Nutrition; VME 5242C— Physiology of Body Fluids.

PSE 6227—Advanced Poultry Management (3) Poultry management presented on a seminar/short course basis utilizing lecturers currently working in areas under discussion. Field trips made to a variety of commercial operations.
PSE 6415—Advanced Poultry Nutrition (3) *Prereq: ASG 3402, PSE 4411.* Current topics in poultry nutrition, research techniques, formulation of experimental diets, and linear programming procedures and practices.
PSE 6522—Avian Physiology (2-4; max: 4) *Prereq: VME 3202C.* Environmental physiology, ovulation cycle and egg formation, reproductive efficiency, experimental physiological techniques.
PSE 6614—Advanced Poultry Products Technology (3) *Prereq: PSE 4611 or equivalent.* An intensive study of poultry products technology, including chemical, physical, microbial, and organoleptic attributes of eggs and poultry meat.
PSE 6905—Problems in Poultry Science (1-3; max: 8) Individual problems in fields of nutrition, genetics, physiology, poultry and egg marketing and/or technology, and management. H.
PSE 6910—Supervised Research (1-5; max: 5) S/U.
PSE 6931—Topics in Poultry Production (2-3; max: 6) *Prereq: ASG 3003, 3402.* Offered primarily to agricultural extension workers and vocational agricultural teachers, with one of the following topics specified: production principles, principles of handling and marketing, or nutrition.
PSE 6938—Graduate Seminar in Poultry Science (1; max: 2)
PSE 6940—Supervised Teaching (1-5; max: 5) S/U.
PSE 6971—Research for Master's Thesis (1-15) S/U.

PSYCHOLOGY
College of Liberal Arts and Sciences

GRADUATE FACULTY 1993-94

Chairman: R. D. Sorkin. *Graduate Coordinator:* D. D. Nevill. *Graduate Research Professors:* Y. Brackbill; D. M. Green; P. J. Lang; P. Teitelbaum; W. B. Webb. *Professors:* J. Archer; W. K. Berg; M. N. Branch; H. J. Brockmann; E. D. Capaldi; W. C. Cunningham; W. W. Dawson; D. A. Dewsbury; F. R. Epting; E. B. Fennell; I. S. Fischler; J. R. Goldman; H. A. Grater; R. A. Griggs; B. Iwata; J. H. Johnson; S. G. Kosch; C. M. Leonard; C. M. Levy, Jr.; E. F. Malagodi, Jr.; M. E. Meyer; P. H. Miller; S. A. Miller; J. I. Morgan; G. J. Neimeyer; D. D. Nevill; H. S. Pennypacker, Jr.; N. W. Perry; J. L. Resnick; N. E. Rowland; P. G. Schauble; B. R. Schlenker; L. J. Severy; R. D. Sorkin; D. I. Suchman; C. M.

Tucker; C. J. VanHartesveldt; C. J. Vierck; D. W. Walker; R. C. Ziller. *Associate Professors:* M. J. Farrar; M. A. Fukuyama; E. E. Hall; M. Heesacker; B. S. Probert; D. Stehouwer; R. West; K. D. White. *Assistant Professors:* F. D. Eyler; T. D. Hackenberg; J. A. Shepperd; A. C. Spector.

The Department of Psychology offers the Master of Science and the Doctor of Philosophy degrees. Students are not accepted for a terminal master's degree.

Doctoral areas of specialization include the teaching and research areas of cognition and sensory processes, comparative, developmental, experimental analysis of behavior, psychobiology, social psychology, and counseling psychology. The training program in counseling psychology is accredited by the American Psychological Association. A predoctoral internship of one year is required for the counseling psychology program.

Undergraduate preparation should include at least one course in experimental psychology and one course in statistics. Other courses in psychology should include at least three or four of the following: cognition, developmental, learning, personality, physiological, sensory, and social. Applicants with GRE scores lower than 1200 are usually not admitted to graduate study in psychology.

CBH 5085—Seminar in Comparative Psychology (3) *Prereq: CBH 3003 and STA 3023.* Intensive study of selected topics. Seminar format with emphasis on individual participation.

CBH 6056—Comparative Psychology (3; max: 9) *Prereq: consent of instructor.* A survey of literature.

CBH 7088—Advanced Seminar in Comparative Psychology (3; max: 15) *Prereq: CBH 6056.*

CLP 6169—Seminar: Psychology and Deviant Behavior (3; max: 6) Analysis of specific deviant behaviors, with emphasis on theory and research related to diagnosis and clinical management.

CLP 6498—Sex Therapy: Principles and Applications (3) *Prereq: consent of instructor.* The etiology of sexual dysfunctions and dissatisfaction, sex counseling research, and cognitive and behavioral approaches used in sex therapy.

DEP 6057—Advanced Developmental Psychology I (3) Surveys research literature on developmental changes during infancy and cognitive development during childhood.

DEP 6058—Advanced Developmental Psychology II (3) Advanced coverage of child social/personality development and cognitive/personality development in adolescence through old age.

DEP 6059—Seminar: Special Topics in Developmental Psychology (1-3; max: 12) Examination of theory and research in selected topic.

DEP 6099—Survey of Developmental Psychology (2-3; max: 3) *Prereq: graduate status.* Empirical, theoretical, and methodological foundations of developmental psychology.

DEP 6409—Seminar: Adult Development and Aging (3; max: 9) Topics in the psychology of aging, with emphasis on theory, research, and methodology.

DEP 6799—Current Research Methods in Developmental Psychology (3) Methods for study of development, including experimental and observational techniques.

DEP 6936—Current Research in Developmental Psychology (1-2; max: 20)

DEP 7608—Theories of Developmental Psychology (3) Theoretical perspectives and major theorists in child and developmental psychology.

EAB 5055—Advanced Experimental Analysis of Behavior (3) *Prereq: EAB 3002, STA 3023, and consent of instructor.* Principles of behavior and analysis, contemporary theory, experimental findings, and research methods in operant behavior.

EAB 5436—Behavioral Pharmacology (3) *Prereq: EAB 3002, STA 3023.* Experimental analysis of the mechanisms based on interactions of drugs with environmental variables controlling behavior.

EAB 6099—Survey of Behavior Analysis (2-3; max: 3) *Prereq: admission to graduate status or permission of instructor.* Survey of basic learning and motivational processes including operant and classical conditioning. Introduction to individual-subject research methods and to applied behavior analysis.

EAB 6118—Theoretical Foundations of Behavior Analysis (3) *Prereq: EAB 5055 and consent of instructor.* Examination of current theoretical issues in behavior analysis, with emphasis upon systematic integration of behavior principles into general behavior theory.

EAB 6707—Applied Behavior I (3) Research methods. Measurement, reliability, experimental design, extension of basic research to applied settings.

EAB 6708—Applied Behavior II (3) Comprehensive review of appropriate literature. Historical and contemporary research across a variety of subject populations, settings, dependent and independent variables.

EAB 6716—Behavior Analysis in Developmental Disabilities (3) *Prereq: EAB 3764 and consent of instructor.* Behavioral approaches to study and treatment of mental retardation and developmental disabilities. Acquisition techniques, assessment, and treatment of behavior disorders, program evaluation, and management.

EAB 6719—Seminar: Strategies and Tactics of Human Behavioral Research (3) *Prereq: EAB 6707.* Advanced study of a scientific approach to investigating human behavior in applied settings.

EAB 6937C—Seminar: Special Topics in Experimental Analysis of Behavior (1-4; max: 9) *Prereq: EAB 6098.* Current research, theory, and instructional techniques.

EAB 6939—Seminar: Special Topics in Applied Behavior Analysis (1-3; max: 9) Current research, technological developments, and professional issues.

EAB 7089—Advanced Seminar: Experimental Analysis of Behavior (3; max: 9) *Prereq: EAB 5055, 6098 and consent of instructor.* Restricted areas of experimental analysis of behavior such as schedules of reinforcement, stimulus control, current issues in research methods, and complex repertoires.

EAB 7739—Advanced Seminar in Behavioral Medicine (3) *Prereq: consent of instructor.* Analysis of daily activities such as smoking, alcohol consumption, and overeating that contribute to chronic disease states is undertaken with review of relevant literature.

EAB 7799—Advanced Seminar: Applied Analysis of Behavior (3) Literature and methods in special applied settings and populations.

EGC 6414—Introduction to Family Counseling (3) *Prereq: EGC 6416 and 8 credits of PCO 7948.*

EGC 6418—Marriage Counseling (3) *Prereq: PCO 6258 and permission of instructor.* Survey of psychodynamic, behavioral, and systemic approaches to marriage counseling. Both didactic and experiential emphases.

EGC 7415—Advanced Seminar in Family Counseling (3) *Prereq: EGC 6414.*

EXP 5256—Human Factors I (3) Survey of human factors literature. Introduction to topics including human capabilities and human interfaces with human-machine systems.

EXP 6099—Survey of Cognition and Sensory Processes (2-3; max: 3) *Prereq: graduate status.* Empirical and theoretical foundations.

EXP 6107—Research Methods in Sensory Systems (3; max: 6) *Prereq: BMS 6512, EXP 6108.* Participation in laboratory experiments typical of several major areas, including visual, auditory, chemical and somesthetic, and pain sensory specialities.

EXP 6108—A Survey of Sensory Systems (3) *Prereq: PCP 5745 or BMS 6510.* Specialists provide a survey of theories and experimental data on human and subhuman sensory reception and

encoding. Auditory, visual, and cutaneous and chemical senses are included.

EXP 6209—Seminar: Perception (3) Conditions, mechanisms, forms, and functions of perceptual processes.

EXP 6609—Seminar: Cognition (3; max: 9) *Prereq: EXP 3604 or consent of instructor.* Selected topics in the areas of thinking, problem solving, and reasoning.

EXP 6717C—Psychophysics (3) *Prereq: EXP 3104.* Methods used to measure organisms; abilities and capabilities, including classical psychophysics, theory of signal detection, scaling, information theory, and modeling.

EXP 6939—Seminar: Current Issues in Cognition and Sensory Processes (3; max: 9) *Prereq: consent of instructor.*

EXP 7689—Research Methods in Cognition (3; max: 12) *Prereq: consent of instructor.*

PCO 6057—Psychology of Counseling I (3) *Prereq: graduate status in the counseling psychology program.* Professional applications and research in cognitive-behavioral and career development theories.

PCO 6058—Psychology of Counseling II (3) *Prereq: graduate status in the counseling psychology program.* Theory and research in humanistic, experiential, and psychodynamic approaches to counseling psychology.

PCO 6059—Psychology of Counseling III (3) *Prereq: graduate students in the counseling psychology program who have completed PCO 6057 and 6058.* Training in counseling skills and techniques used in each of the theoretical approaches to counseling learned in PCO 6057.

PCO 6316C—Psychological Assessment I (3) *Prereq: consent of instructor.* Consideration of basic assessment theory and of fundamental theories of intelligence and intellectual assessment, including practicum-type administration of intelligence tests.

PCO 6317C—Psychological Assessment II (3) *Prereq: consent of instructor.* Consideration of the fundamental theories of personality and individual assessment of personality. Included will be practicum-type administration of personality tests.

PCO 6939—Seminar: Current Topics in Counseling Psychology (3; max: 15) *Prereq: PPE 6098, EGC 6416 or consent of instructor.* Emphasis on theoretical background and implications for applied work.

PCO 7217—Professional Ethics and Skills in Counseling Psychology (3) *Prereq: graduate student status in counseling psychology or consent of instructor.* Professional issues, ethics, relationships, and skills pertaining to practice of counseling psychology.

PCO 7247—Group Counseling/Psychology (3) *Prereq: graduate student status and consent of instructor; coreq: enrollment in counseling practicum.* Process of group counseling and psychotherapy as well as the counselor's role in the facilitation of group process.

PCO 7537—Vocational Counseling Psychology (3) *Prereq: graduate student status and consent of instructor; coreq: enrollment in counseling practicum.* Examination of major theories and research in vocational counseling psychology with emphasis on vocational assessment.

PCO 7948—Practicum in Counseling Psychology (4; max: 16) *Prereq: written application to the Counseling Psychology Practicum Coordinator.* Students perform counseling and consultation functions in university and community agencies under supervision of faculty and staff members. Open only to students in the counseling psychology program. S/U.

PCO 7949—Internship in Counseling Psychology (6; max: 12) *Prereq: written application to the Counseling Psychology Internship Coordinator.* Full-time or equivalent work in a university or community agency where counseling functions are carried out under supervision. Open only to students in the counseling psychology program.

PPE 6059—Seminar in Personality (3; max: 9) Personality development and dynamics.

PPE 6209—Seminar on the Self (3) Developmental organization and change in selected dimensions of self are considered through the life span, methods of study, theory, and research.

PPE 6307—Research Methods I (3) *Prereq: consent of instructor.* Theoretical, methodological, and procedural aspects of research in social-personality. Emphasis on issues related to measurement of social-personality variables.

PPE 6308—Research Methods II (3) *Prereq: PPE 6307 or consent of instructor.* Theoretical, methodological, and procedural aspects of research in social-personality. Emphasis on issues encountered in the design and analysis of experiments.

PPE 7288—Advanced Theories in Personality (3; max: 9) Theoretical orientations in personality and research development; particular groups of theorists examined.

PSB 5325—Human Physiological Psychology: Psychophysiology (3) *Prereq: PSB 3004 or equivalent or consent of instructor.* Survey of research literature and procedures relevant to the study of physiological effects of events in humans. Topics to be discussed include brain waves, skin resistance, cardiovascular responses to arousal and stress, orienting and defense reactions, biofeedback, learning, and conditioning. Several laboratory sessions augment lectures and discussions.

PSB 5445—Drug Use and Abuse (3) *Prereq: 6 hours of psychology.* Objective, informational approach to the commonly used and abused drugs. Psychological, physiological, social, medical, legal, and historical aspects.

PSB 5935—Seminar in Physiological Psychology (1-3; max: 10) *Prereq: PSB 3004 or 3054 and STA 3023.* Selected topics in behavioral neuroscience. S/U option.

PSB 6067—Human Brain Functions (3) *Prereq: PSB 6099 or consent of instructor.* Recent advances in theory and experimental methods.

PSB 6082—Neuroethology (3) *Prereq: PSB 3004, 3054, or 6087 and 4003 and consent of instructor.* Focuses on cellular mechanisms underlying fundamental aspects of behavior, including the production and coordination of movement, sensory processing and sensorimotor integration. Electrophysiological studies of invertebrate and simple vertebrate behaviors.

PSB 6086—Advanced Psychophysiology (3) *Prereq: PSB 5325 or consent of instructor.* Advanced literature and procedures in psychophysiology. Heavily oriented toward development skills and knowledge of the laboratory tools. Students do an independent laboratory project.

PSB 6087—Advanced Physiological Psychology (3) Thorough review of basic concepts in physiological psychology, advanced concepts including methodology and recent progress in selected areas of neuroscience and psychobiology.

PSB 6088L—Behavioral Neurobiology (3) *Prereq: PSB 6087.* Behavioral studies involving physiological manipulations and measures, and criticism of the scientific inferences therein.

PSB 6099—Survey of Physiological and Comparative Psychology (2-3; max: 3) *Prereq: graduate status.* Empirical and theoretical foundations of physiological and comparative psychology.

PSB 7079—Seminar in Psychophysiology (3; max: 9) *Prereq: PSB 5325 or consent of instructor.*

PSB 7118—Current Research Methods in Physiological Psychology (3; max: 12) Advanced training in new electrophysiological and neurochemical techniques used in studying the biological basis of behavior.

PSB 7248—Neurobehavioral Relations (3) *Prereq: PSB 6087.* Theories and data on the central nervous system basis for higher order function. Emphasis will be on arousal, purposeful behavior, and learning.

PSB 7249—Seminar in Neural Mechanisms and Behavior (3) *Prereq: PSB 6087.* Recent and specialized topics in brain-behavior relations.

PSY 6608—History of Psychology (2-3; max: 3)

PSY 6698—Contemporary Theory of Psychology (3) Differences in theoretical viewpoint which give rise to the emphasis responsible for the delineation of distinct theory in modern psychology. Original work of leading theorists and its impact on the science of psychology.

PSY 6905—Individual Work (1-3; max: 10) Reading or research areas in psychology.
PSY 6910—Supervised Research (1-3; max: 5) S/U.
PSY 6930—Topics in Psychology (1-3; max: 9)
PSY 6939—Seminar: The Teaching of Psychology (1-3; max: 10) *Prereq: consent of instructor.* Examination of general techniques of teaching with emphasis on interpersonal nature of teaching, course planning, textbooks, testing and evaluation, and lecturing within the framework of general introductory psychology course. Videotaped lecturers.
PSY 6940—Supervised Teaching (1-3; max: 5) S/U.
PSY 6943—Internship in College Teaching (2, 4, 6; max: 6) *Prereq: graduate standing.* Primarily for Master of Arts in Teaching students but available for student needing additional practice and direction in college-level teaching.
PSY 6971—Research for Master's Thesis (1-6) S/U.
PSY 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.
PSY 7980—Research for Doctoral Dissertation (1-12) S/U.
SOP 5115—Theories in Social Psychology (3) Consideration of modern theories in social psychology in relation to experimental evidence.
SOP 6099—Survey of Social Psychology (2-3; max: 3) *Prereq: graduate status.* Empirical and theoretical foundations of social psychology.
SOP 6218C—Laboratory in Social Psychology: Attitude Scaling (3) Design and analysis of attitude scales, with emphasis on recent developments in the field.
SOP 6219C—Advanced Research Techniques in Social-Personality Psychology (3; max: 12) *Prereq: consent of instructor.*
SOP 6409—Seminar: Current Topics in Social-Personality Psychology (3; max: 12)
SOP 6419—Seminar: Attitudes and Social Cognition (3; max: 12) *Prereq: graduate status.* Seminar addressing topics such as attitude change, attribution, social perception, social cognition, etc.
SOP 6509—Seminar: Interpersonal Relations and Group Processes (3; max: 12) *Prereq: graduate status.* Seminar addressing topics such as impression management, leadership, small group behavior, conflict and accord, and race relations.
SOP 6819—Seminar: Applied Social-Personality Psychology (3; max: 12) *Prereq: graduate status.* Addresses applied and community social psychological topics such as environmental program evaluation, population, community relations and systems, consultation.
SOP 6929—Colloquium in Research in Social-Personality Psychology (1; max: 8) *Prereq: graduate status in social-personality psychology.* On-going colloquium series intended for graduate students in social-personality psychology involving the presentation and discussion of research initiatives.
SOP 7318—Multidimensional Scaling for Market and Societal Analysis (3) *Prereq: STA 6167 or equivalent and fundamentals of matrix algebra.* Derivation of utilities from preferential choices; measurement of spatial attributes underlying utility; principal components and distance decompositions; scaling categorical judgments in survey research.
SOP 7319—Seminar: Research in Social Psychology (1-4; max: 12) *Prereq: consent of instructor.* Consideration of theory, research design, analytical procedures, and substantive findings in selected areas of social psychology such as prosocial behavior, attitudes, personal space, impression management, attitude formation and change, leadership, and small group behavior.
SOP 7339C—Social Psychology Research in the Community (3) Consideration of problems and techniques of experimentation in natural settings.
SOP 7749L—Internship in Applied Social Psychology (1-5; max: 15) *Prereq: graduate standing in social psychology.* Field experience in applied or community settings for social psychology graduate students.

RECREATION, PARKS, AND TOURISM
College of Health and Human Performance

GRADUATE FACULTY 1993-94

Chairman: P. R. Varnes. *Graduate Coordinator:* R. M. Beland. *Professors:* R. Leilich; P. Varnes. *Associate Professors:* R. Beland; B. M. Cato; M. B. Chafin; S. Holland; G. E. McCall; L. H. Thornton. *Assistant Professors:* J. C. Crotts; D. J. Gamble.

The degree Master of Science in Recreational Studies is offered by the Department of Recreation, Parks, and Tourism.

The program provides advanced preparation of recreation professionals for positions of leadership in planning, developing, and administering programs of recreation in a variety of employment settings. Concentrations of study may be developed in a number of areas, such as recreation resource planning and management, tourism and commercial recreation, therapeutic recreation, campus recreation programming and administration, administration and supervision, and other critical recreation and leisure areas.

The recreation curriculum is individualized, and applicants with bachelor's degrees from related fields are accepted into the program. Previous work is evaluated and programs are planned according to individual needs, interests, and career objectives.

HLP 6515—Evaluation Procedures in PHR (3)
HLP 6535—Research Methods (3)
LEI 5188—Trends in Leisure Studies (3)
LEI 5255—Outdoor Recreation (2) Outdoor recreation processes as they relate to foundations, problem solving, and planning.
LEI 6108—Contemporary Theories of Recreation and Leisure (3)
LEI 6495—Campus Recreation Administration and Programming (3) Innovation and development of campus recreation at the community college and university levels.
LEI 6513—Administrative Procedures in Leisure Services (3) Problems and procedures involving the administration of leisure services.
LEI 6557—Recreation Management/Development in the Coastal Zone (3) Introduction to the coastal environment as a predominant setting for recreation activity and development. Examine specific recreational problems associated with coastal zone management within the framework of coastal resources. Survey of public-private issues, planning concerns, and user conflicts common in the coastal zone.
LEI 6704—Therapeutic Recreation Delivery Systems (3) Investigation of therapeutic recreation services.
LEI 6895—Tourism Analysis (3) Quantitative methods used by tourism planners, researchers, and consultants in understanding this highly fragmented industry.
LEI 6905—Directed Independent Study (1-5; max: 10) Individual projects under faculty guidance.
LEI 6940—Supervised Teaching (1-5; max: 5) S/U.
LEI 6944—Practicum in Leisure Studies (1-6; max: 6)
LEI 6971—Research for Master's Thesis (1-15) S/U.

REHABILITATION COUNSELING
College of Health Related Professions

GRADUATE FACULTY 1993-94

Chairman: H. W. Sawyer. *Graduate Coordinator:* J. G. Joiner. *Associate Director:* J. P. Saxon. *Professors:* H. W. Sawyer; J. P. Saxon. *Associate Professor:* J. G. Joiner. *Assistant Professors:* L. R. Shaw; R. J. Spitznagel.

The rehabilitation counseling program is accredited by the Commission on Rehabilitation Education. The program is designed to prepare professional personnel to assist people to overcome mental, physical, or emotional handicaps toward personal and vocational independence. Students may specialize through selecting appropriate practicum and internship experiences and elective courses. The areas of specialization are emotional illness, mental retardation, offender rehabilitation, private sector rehabilitation, rehabilitation of the aging, and vocational evaluation. The program consists of four semesters, including a one-semester full-time internship. Appropriate course selection meets requirements for national and state licensure and certification in rehabilitation counseling and mental health counseling.

In addition to the requirements of the Graduate School, acceptance into the program is dependent upon the completion of an appropriate undergraduate degree, relevant vocational background, and demonstrated interest in the helping professions.

EGC 5065—Introduction to Rehabilitation Counseling (3) Orientation to the rehabilitation process, including a survey of history, principles, philosophy, and legal aspects of rehabilitation and related fields.
EGC 5166—Psychological and Sociological Aspects of Rehabilitation (3) Social and personal problems of persons with disabilities; psychological aspects of physical and mental disabilities.
EGC 6374—Occupational Aspects of Rehabilitation Counseling (3) Work behavior development and adjustment; work environmental factors; job analysis and adaptation; planning, placement, and follow-up.
EGC 6375—Vocational Assessment in Rehabilitation Counseling (3) Methods of vocational evaluation including measurement concepts and the use of psychometric tests and work assessment systems with persons with disabilities.
EGC 6376—Medical and Related Aspects of Rehabilitation Counseling (3) Medical implications of disability as it relates to the rehabilitation process. Topics cover the etiology, prognosis, and treatment of persons with disabilities.
EGC 6377—Vocational Placement and Training in Rehabilitation (3) Job development and placement techniques. Analysis of labor market opportunities and litigation issues concerning vocational placement of persons with disabilities.
EGC 6493—Rehabilitation Counseling Theories (3) Individual and group counseling theories and applications to persons with disabilities.
EGC 6693—Seminar: Selected Rehabilitation Topics (1-4; max: 8) Lectures and seminars on selected topics of current interest in rehabilitation.
EGC 6767—Rehabilitation Research (3) Research design and methodology, programmatic evaluation, research utilization.
EGC 6850—Rehabilitation Client Services Practicum (3) Develop basic knowledge and skills in initial interviewing and counseling techniques and initiate supervised work experience in a rehabilitation facility or agency with general emphasis on the rehabilitation process and the client services delivery system.
EGC 6851—Rehabilitation Counseling Practicum (3) Supervised counseling in a rehabilitation agency or facility. The emphasis is on counselor-client relationships in personal and adjustment counseling.
EGC 6853—Advanced Rehabilitation Counseling Practicum (2-3; max: 6) *Prereq: EGC 6493, 6850, and 6851.* Supervised counseling and casework with emphasis on the process and outcome of rehabilitation procedures.
EGC 6885—Internship in Rehabilitation Counseling (6-12; max: 12) Intensive supervised experience in a rehabilitation setting or facility. Works with a caseload providing counseling, assessment, placement, and follow-up services to disabled clients.
EGC 6905—Individual Work (1-4; max: 4) Allows graduate students in rehabilitation counseling to pursue work not available in other courses.
EGC 6910—Supervised Research (1-5; max: 5) S/U.
EGC 6931—Special Topics (1-3; max: 9) Study of topics in research and practice in rehabilitation counseling.
EGC 6940—Supervised Teaching (1-5; max: 5) S/U.

RELIGION
College of Liberal Arts and Sciences

GRADUATE FACULTY 1993-94

Chairman: A. A. Nanji. *Graduate Coordinator:* G. R. Thursby. *Professors:* A. B. Creel; M. V. Gannon; R. H. Hiers; S. S. Hill; A. Nanji; V. R. Narayanan; H. M. Stahmer. *Associate Professors:* D. G. Hackett; S. R. Isenberg; G. R. Thursby.

The Department of Religion offers the Master of Arts degree. Advanced work is available in the following areas: religion in American culture, Asian religions, religions of India, Judaism, Christianity, Islam, religious ethics and society, philosophy of religion, and Biblical studies.

In addition to meeting the general requirements of the Graduate School, degree candidates must have attained a reading knowledge of at least one classical or foreign language, and completed 30 credits including the following: (1) REL 6035 and 6936 (6 credits); (2) 12 credits in an area of concentration that will serve as context for the master's thesis; (3) 6 credits outside this area of concentration, which may constitute a minor taken in another academic discipline; and (4) a thesis for which no more than 6 credits of REL 6971 are counted in the minimum requirements for the degree. Students planning to apply for admission should take the Graduate Record Examination Aptitude Test well in advance of the desired date of matriculation.

Further information may be obtained from the Graduate Coordinator, Department of Religion, 125 Dauer Hall (904/392-1625).

Prospective students must submit to the Department a 1000-word statement indicating the area of specialization or type of program they wish to pursue, and their reasons for doing so. Applicants must have completed at least 24 semester hours of undergraduate study in the humanities and social sciences, including 12 semester credits in religion which reflect preparation in Western and Asian religious traditions. A minimum score of 600 on the verbal portion of the Graduate Record Examination is normally required for admission to the program. For other admissions requirements, see the *General Information* section of this *Catalog.*

REL 5137—Religion and American Culture (3; max: 6) Examination of the religious bodies in the United States, from historical, sociological, and theological perspectives.
REL 5195—Topics in Religion and Society (3; max: 6) Investigation of the interaction between religious bodies and the structures of the societies in which they function, with particular attention to the United States.

REL 5297—Topics in Biblical Studies (3; max: 9) Study of the methods of interpretation of particular texts or themes chosen from Hebrew scriptures or the Christian New Testament.
REL 5365—Studies in Islam (3; max: 9) Historical study of development of selected doctrines, institutions, and practices, using primary and interpretative material.
REL 5395—Topics in Asian Religions (3; max: 9) Study of the religious traditions which are indigenous to India, China, or Japan.
REL 5495—Topics in Religious Thought (3; max: 9) Investigation of particular themes in a religious tradition or the comparative approach to intellectual dimensions of religious communities.
REL 5549—Studies in Christianity (3; max: 9) Historical study of development of selected Christian practices, doctrines, and institutions, using primary sources and interpretative material.
REL 5696—Topics in Jewish Thought (3; max: 9) Themes, issues, and personalities in the Jewish tradition, from the biblical period through modern times.
REL 5906—Individual Work (1-5; max: 12) Study of chosen materials under the individual direction of a member of the graduate faculty. Plan of study and method of evaluation must be approved by the graduate committee in advance.
REL 5937—Topics in Religious Studies (3; max: 9) Issues and methods in the study of religion; generally more than one religious tradition is studied.
REL 6035—History, Philosophy, and Theories of the Study of Religion (3) Examination of classical formulations of various approaches to the academic study of religion. Required of all candidates for the M.A. degree.
REL 6910—Supervised Research (1-5; max: 5) S/U.
REL 6936—Seminar in Religious Studies (3; max: 9) Application of contemporary social scientific, historical, and cultural methodologies to an understanding of a classical theme in religious studies. Required of all candidates for the M.A. degree.
REL 6940—Supervised Teaching (1-5; max: 5) S/U.
REL 6971—Research for Master's Thesis (1-15) Required of all candidates for the M.A. degree. S/U.

ROMANCE LANGUAGES AND LITERATURES
College of Liberal Arts and Sciences

GRADUATE FACULTY 1993-94

Chairman: R. Johnson. *Associate Chairman:* D. A. Pharies. *Graduate Coordinators:* A. O. Avellaneda (Spanish); S. R. Baker (French). *Graduate Research Professors:* W. Calin; A. Prieto. *Professors:* A. O. Avellaneda; S. R. Baker; D. A. Bonneville *(Emeritus)*; B. Cailler; J. Casagrande; G. T. Diller; R. Gay-Crosier; R. Johnson; G. C. Nichols; D. A. Pharies; A. B. Smith *(Emeritus)*. *Associate Professors:* E. Baker; R. Jimenez; C. J. Murphy; C. A. Perrone. *Assistant Professors:* B. Fra-Molinero; E. Mallen; J. M. Padden.

The Department offers programs leading to the Ph.D. in Romance languages and literatures, with specialization in French or Spanish, and the M.A. in French or Spanish (either with or without thesis).

Candidates for the master's degree in French or Spanish have a choice of two options, one oriented toward literature, the other toward language. In conjunction with their master's or doctoral work, students specializing in Spanish may also earn a Certificate in Latin American Studies. Though a graduate degree is not given in Portuguese, extensive course offerings permit students to develop a strong minor in Portuguese language and literature (particularly Brazilian).

Prerequisite for admission to graduate work is an undergraduate major in the language, including advanced courses in both literature and language, or the equivalent. Candidates for the Ph.D. are required to take FOL 6735 and FRW 6805 or SPW 6806.

The foreign language requirement varies with degree and specialization; for details, consult the appropriate graduate coordinator. Every degree candidate is given the opportunity to gain teaching experience, either through a teaching assistantship or through participation in a departmental internship program.

FOL 6735—Introduction to Romance Linguistics (3) *Prereq: LIN 3010 or equivalent; knowledge of at least one Romance language.* Comparative study of the major Romance languages and their development from Latin.
FOW 6930—Special Study in Romance Languages and Literatures (1-3; max: 9) Selected topic or problem (e.g., Medieval Romance lyric poetry) involving two or more Romance languages.

French

FRE 6060—Beginning French for Graduate Students I (3) For students with no formal preparation who need a reading knowledge. S/U.
FRE 6061—Beginning French for Graduate Students II (3) *Prereq: FRE 6060 or the equivalent.* For students who need proficiency in reading. S/U option.
FRE 6466—Advanced Translation and Stylistics (3) Translation from English to French and French to English. Texts selected from modern authors. Various genres and styles.
FRE 6735—Special Study in French Linguistics (3)
FRE 6785—French Phonetics and Phonology (3)
FRE 6845—History of the French Language (3)
FRE 6855—Structure of French (3)
FRE 6940—Supervised Teaching (1-5; max: 5) S/U.
FRE 6943—Internship in College Teaching (2, 4, 6; max: 6) *Prereq: graduate standing.* Required for students needing practice and direction in college-level teaching.
FRW 6215—French Prose of the Renaissance (3)
FRW 6217—Seventeenth-Century French Prose (3)
FRW 6276—The Novel of the Eighteenth Century (3)
FRW 6288—Twentieth-Century French Novel (3)
FRW 6315—Seventeenth-Century French Drama (3)
FRW 6328—Twentieth-Century French Theater (3)
FRW 6346—French Poetry of the Renaissance (3)
FRW 6355—Modern French Poetry (3)
FRW 6415—Early French Medieval Literature (3)
FRW 6416—Later French Medieval Literature (3)
FRW 6536—The Romantic Period (3)
FRW 6556—French Realism and Naturalism (3)
FRW 6715—The Philosophic Movement (3)
FRW 6755—Sub-Saharan, Maghrebian, and Caribbean Literatures in French (3; max: 9)
FRW 6805—Introduction to Graduate Study and Research (3) Tools, problems, and methods of literary and linguistic research.
FRW 6825—French Critical Theory (3)
FRW 6900—Special Study in French Literature (3; max: 9) Selected topic or problem (varied each semester).
FRW 6905—Individual Work (1-3; max: 9) *Available only by special arrangement with graduate adviser.*
FRW 6910—Supervised Research (1-5; max: 5) S/U.
FRW 6938—Seminar in French Literature (3; max: 15) Intensive research study of an author or topic.

FRW 6971—Research for Master's Thesis (1-15) S/U.
FRW 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.
FRW 7980—Research for Doctoral Dissertation (1-15) S/U.

Portuguese

POW 6275—The Nineteenth-Century Brazilian Novel (3)
POW 6276—The Twentieth-Century Brazilian Novel (3)
POW 6385—Brazilian Lyric (3)
POW 6386—Brazilian Drama (3)
POW 6405—Medieval and Renaissance Portuguese Literature (3)
POW 6905—Individual Work (1-3; max: 9) *Available only by special arrangement with graduate adviser.*
POW 6930—Special Study in Brazilian or Portuguese Literature (3) Selected topic or problem (varied each semester).

Spanish

SPN 6060—Beginning Spanish for Graduate Students I (3) For students with no formal preparation who need a reading knowledge. S/U.
SPN 6061—Beginning Spanish for Graduate Students II (3) *Prereq: SPN 6060 or the equivalent.* For students who need proficiency in reading. S/U option.
SPN 6315—Advanced Composition and Syntax (3)
SPN 6735—Special Study in Spanish Linguistics (3: max: 12)
SPN 6785—Advanced Spanish Phonetics (3)
SPN 6845—History of Spanish Language (3)
SPN 6855—The Structure of Spanish (3)
SPN 6940—Supervised Teaching (1-5; max: 5) S/U.
SPN 6943—Internship in College Teaching (2, 4, 6; max: 6) *Prereq: graduate standing.* Required of all graduate students who will be involved in teaching and have not had a similar course elsewhere.
SPW 6209—Colonial Spanish-American Literature (3)
SPW 6216—Spanish Prose Fiction of the Golden Age (3)
SPW 6237—The Spanish-American Narrative from the Origins to Criollismo (3)
SPW 6269—Spanish Novel of the Nineteenth Century (3)
SPW 6276—Spanish Post-War Narrative (3)
SPW 6285—Contemporary Spanish-American Narrative I (3)
SPW 6286—Contemporary Spanish-American Narrative II (3)
SPW 6306—Spanish-American Theater (3)
SPW 6315—Spanish Drama of the Golden Age (3)
SPW 6325—Contemporary Spanish Theater (3)
SPW 6337—Spanish Poetry of the Golden Age (3)
SPW 6345—Twentieth-Century Spanish Poetry (3)
SPW 6356—Spanish-American Poetry from Romanticism to Vanguardism (3)
SPW 6357—Contemporary Spanish-American Poetry (3)
SPW 6366—The Spanish-American Essay (3)
SPW 6400—Old Spanish Literature (3)
SPW 6535—Spanish Romanticism (3)
SPW 6606—Cervantes (3)
SPW 6726—Generation of 1927 to the Present (3)
SPW 6729—The Generation of '98 (3)
SPW 6806—Introduction to Graduate Study and Research (3) Tools, problems, and methods of literary and linguistic research.
SPW 6902—Special Study in Spanish or Spanish-American Literature (3; max: 9) Selected topic or problem (varied each semester).
SPW 6905—Individual Work (1-3; max: 9) *Available only by special arrangement with graduate adviser.*
SPW 6910—Supervised Research (1-5; max: 5) S/U.
SPW 6938—Seminar in Spanish Literature and Culture (3; max: 9) *Prereq/coreq: SPW 6806.*
SPW 6971—Research for Master's Thesis (1-15) S/U.
SPW 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.
SPW 7980—Research for Doctoral Dissertation (1-15) S/U.

SOCIOLOGY
College of Liberal Arts and Sciences

GRADUATE FACULTY 1993-94

Chairman: J. H. Scanzoni. *Graduate Coordinator:* L. Beeghley. *Graduate Research Professor:* J. R. Feagin; G. F. Streib (*Emeritus*). *Professors:* R. L. Akers; F. M. Berardo; L. Beaulieu; L. Beeghley; E. W. Bock (*Emeritus*); L. Crandall; C. E. Frazier; B. L. Gorman; J. F. Gubrium; J. C. Henretta; A. J. LaGreca; G. R. Lee; T. L. McCoy; M. K. Miller; M. L. Radelet; J. H. Scanzoni; G. A. Soares; J. S. Vandiver (*Emeritus*); M. White. *Associate Professors:* D. Berardo; R. Hollinger; L. Lanza-Kaduce; W. Marsiglio; P. J. Richards; K. Seccombe; C. Shehan; H. Vera. *Assistant Professors:* R. S. Ford; B. A. Zsembik.

The Department of Sociology offers the Master of Arts degree with both a thesis and a nonthesis option and the Doctor of Philosophy degree with these areas of special emphasis: criminology/deviance/law, family, gerontology, racial/ethnic relations, Latin American studies, medical sociology, stratification, urban studies, and social psychology.

Admission to the master's degree program requires a bachelor's degree in sociology or relevant social science as approved by the Department. The Department and the College of Law offer a joint M.A./J.D. program. Admission for the two degrees must be simultaneous. Admission to the Ph.D. program requires a master's degree in sociology or related field as approved by the Department. Students planning to apply for admission should take the Graduate Record Examination at the earliest possible date. The GRE Sociology Test is recommended for all applicants for admission and is required of all applicants for assistantships and fellowships. Applicants for admission who do not have a degree in sociology must also take the GRE Sociology Test.

A course taught in the College of Nursing, NGR 6609—Family Dynamics and Organized Health Care, is sociological in content and comprises a part of the offerings of the Department of Sociology in medical sociology.

SYA 5905—Individual Work (1-4; max: 12 including SYA 6905)
SYA 5933—Special Study in Sociology (3; max: 6)
SYA 6115—Development of Sociological Thought (3) Comparative study of the major ideas of the principal contributors to the development of sociology. Emphasis on relevance of these ideas to contemporary social thought and current social issues.
SYA 6125—Classical Sociological Theory (3) Study of sociological theory from its inception in the early 19th century to about 1930. Deals with the ideas of Comte, Spencer, Marx, Weber, Simmel, Durkheim, Pareto, Mead, and others.
SYA 6126—Contemporary Sociological Theory (3) The study of modern sociological theories; roughly 1930 to the present.
SYA 6305—Methods in Social Research I (3) Survey of quantitative and qualitative methods of social research, design, data collection.

SYA 6306—Methods in Social Research II (3) *Prereq: SYA 6305.* Evaluation and completion of topics and projects from SYA 6305.
SYA 6315—Qualitative Research Methods (3) Fieldwork, observation, participant observation, and other qualitative data collection, and analysis techniques.
SYA 6347—Research Problems in Deviance (3) Surveys substantive issues relating to sources of data, methods of analysis, and specific research areas.
SYA 6348—Survey Research (3) Sampling, instrument development, interviewing, field supervision, and other crafts involved in data collection and measurement in social sciences.
SYA 6407—Quantitative Research Methods (3) *Prereq: STA 6126.* Application of selected quantitative methods to sociological research problems; extensive practice in application of the methods.
SYA 6605—Advanced General Sociology (3) Intensive study at an advanced level of the general principles of sociology.
SYA 6655—Evaluation Research (3) Methods and issues in evaluation and applied research on social problems.
SYA 6905—Individual Work (1-4; max: 12 including SYA 5905) Designed to permit work on subjects not available in currently offered courses.
SYA 6910—Supervised Research (1-5; max: 5) S/U.
SYA 6940—Supervised Teaching (1-5; max: 5) S/U.
SYA 6941—Internship in Applied Sociology (3) Supervised individual practicum in sociology.
SYA 6942—Applied Social Research Project (3) Supervised individual or team applied research project.
SYA 6971—Research for Master's Thesis (1-15) S/U.
SYA 7135—Sociology of Knowledge (3) Examination of variations in the social origin of knowledge and knowledge systems.
SYA 7933—Special Study in Sociology (3; max: 9)
SYA 7935—Advanced Study in Sociology (3; max: 6) *Prereq: M.A. or equivalent degree in sociology.*
SYA 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.
SYA 7980—Research for Doctoral Dissertation (1-15) S/U.
SYD 6045—Population (3) Seminar in a review of theoretical approaches to the study of fertility, mortality, and migration. The relationship between population growth and socioeconomic development. Computer application of demographic research methods.
SYD 6135—Demographic Processes and Methods (3) Advanced review of methods and materials of demographic analysis.
SYD 6145—Population Policy (3) Review of past and current U.S. population policies. Formulation of policy in the light of numerous criteria and goals. Direct and indirect consequences of selected policies, their implementation and evaluation.
SYD 6436—Metropolitan Growth and Development (3) *Prereq: 8 hours in social sciences.* Examines the main facets of the dynamics of urban growth/decline and how these affect the social order of a given population: population factors, formation/deterioration of community ties, urban housing social control, transportation, and other subjects reflecting the complexity of urban life.
SYD 6506—Urban Ecology (3) Examines the main theoretical frameworks used in understanding the dynamics of urban space utilization; most recent methodological approaches applied in studying urban space; practical consequences of urban spatial patterns, neighborhood development, racial segregation, and service delivery problems.
SYD 6635—Latin American Societies (3) General introduction to Latin America, its history, social structure, and overview of the major political, economic, and social processes.
SYD 6636—Latin American Development (3) An analysis of social and economic development in Latin America with emphasis on industrialization, the agrarian structure, the role of the state and dependency.
SYD 6705—Minorities (3) Seminar: dominant group-minority group relations, with particular reference on racial, religious, and ethnic minorities in American society.
SYO 6107—American Families (3) Impact of rapid social changes upon families: racial, class, and ethnic variations. Liberation of women and changing family roles. Alternative life styles and the future's families.
SYO 6126—Family Theories (3) An examination of historical and contemporary developments related to family theories. Focuses on conceptual frameworks utilized in family analyses, the construction of family theories, and their application to subareas within the field of sociology.
SYO 6135—Comparative Family Systems (3) An intercultural and historical analysis of the family. Emphasizes development of the Western family. U.S. kinship system within the historical and intercultural context.
SYO 6175—Family Research (3) Seminar in the major empirical approaches to the analysis of family relationships.
SYO 6185—Families and Work (3) Changing links between employment and families/households. Historical and demographic factors associated with women's employment in U.S. Impact of dual-employment on household/family dynamics examined from social psychological perspective.
SYO 6305—Sociology of Politics (3) Analysis of the social foundations of political behavior and political institutions.
SYO 6375—Occupations and Professions (3) Work as a human activity. Occupations and professions as mediators between individuals and society. The occuational world. Work and its organization in relation to power, deviance, health, aging, and other social phenomena.
SYO 6405—Medical Sociology (3) General overview of health and illness behavior, health care delivery, social epidemiology, and health services utilization.
SYO 6406—Social Factors in Health and Illness (3) Social-psychological examinations of illness behavior, issues in the definition of health and help seeking, doctor-patient relations, and social effects of disease.
SYO 6415—Sociology of Mental Health (3) Differential prevalence of mental illness, and organization and delivery of mental health services.
SYO 6425—Health Services Organization (3) Organization of health care delivery system in U.S., with emphasis on evaluation and planning.
SYO 6535—Social Inequality (3) The unequal distribution among individuals and groups of wealth, power, and prestige; the effect of class systems upon society; the effect of class membership on individuals; social mobility.
SYO 6545—Complex Organizations (3) The behavior of individuals and systems in formal organizations; bureaucratic models; government, hospital, church, school, industry, as manifestations of a common principle.
SYO 6556—Comparative Sociology: Theory and Methods (3) Analysis of regularities and differences among societies. The importance of cross-societal research for building sociological theories.
SYP 6006—Personality and Social Structure (3) The impact of social structure upon the statuses and roles of individual human beings. Personality development, role behavior, adult socialization, self-image, and self-evaluation; and the effects of assigning persons to different social positions.
SYP 6065—The Sociology of Human Sexuality (3) Social sources and social consequences of ideas concerning human sexuality as they emerge from sociological study of Western and non-Western thought.
SYP 6115—Seminar in Symbolic Interaction (3) A sociological perspective on the self, with special emphasis on the role of language, symbols, and culture in relation to identity, socialization, and social structure.
SYP 6355—Collective Behavior and Social Movements (3) Panic, riot, crowd, mob, fad, fashion, audience, and public opinion and

mass behavior. Reform, protest, cult, revolution, and other movements. Individual and societal implications.

SYP 6515—Deviance (3) Advanced study of various forms and types of deviant, criminal, and delinquent behavior.

SYP 6517—Theories of Crime and Deviance (3) Review and critique of major social and behavioral theories of crime, delinquency, and deviance.

SYP 6525—Criminology (3) Nature and causes of crime, criminality, and criminal careers. Research in crime and delinquency. Sociological analysis of criminal law, criminal justice, rehabilitation, punishment, prevention, and deterrence.

SYP 6535—Juvenile Delinquency (3) Causes and explanations of juvenile delinquency and youth crime. Types of delinquents, sociological analysis of the juvenile justice system, treatment, and prevention.

SYP 6545—Sociology of Law (3) A sociological perspective on law and control in society, development of law, operation of the legal system, the legal profession, social change, power and conflict, and impact of law and legal sanctions and society.

SYP 6550—Sociology of Alcohol and Drug Behavior (3) *Prereq: graduate or postbaccalaureate status in sociology and permission of instructor.* Sociology of deviate alcohol and drug use and abuse; emphasis on social structure, process, and policy; sociological and social psychological explanations of substance use and abuse; public policy, law enforcement, prevention, and treatment.

SYP 6735—Sociology of Aging and the Life Course (3) Social and personal conditions of post-retirement years; family and housing patterns, income, leisure, health, group processes, and evaluation of institutional care of the aged.

SYP 6736—Sociology of the Aged (3) A survey of major sociological issues and concepts relating to aging and the aged; social stratification, family, social norms, social networks, community. Economic security, health, housing, and retirement are also discussed.

SYP 6745—Sociology of Death and Survivorship (3) The sociological dimensions of death, bereavement, and widowhood; ritualistic customs and behavior associated with death on both intra- and cross-cultural bases; contemporary issues associated with death-related phenomena; social and environmental factors affecting survivor adaptation.

SOIL AND WATER SCIENCE
College of Agriculture

GRADUATE FACULTY 1993-94

Chairman: G. A. O'Connor. *Graduate Coordinator:* J. B. Sartain. *Graduate Research Professors:* P. S. C. Rao; K. R. Reddy. *Professors:* E. E. Albregts; R. B. Brown; D. V. Calvert; M. E. Collins; N. B. Comerford; J. M. Davidson; D. A. Graetz; J. H. Graham; L. C. Hammond; D. R. Hensel; A. G. Hornsby; D. H. Hubbell; G. Kidder; R. S. Mansell; B. L. McNeal; D. G. Neary; H. L. Popenoe; F. M. Rhoads; J. B. Sartain; G. H. Snyder; E. L. Stone; D. M. Sylvia. *Associate Professors:* E. A. Hanlon; W. G. Harris; C. T. Johnston; P. Nkedi-Kizza; J. E. Rechcigl; R. D. Rhue; C. D. Stanley. *Associate Scientist:* L. T. Ou. *Assistant Professors:* A. K. Alva; P. M. Gale; T. A. Obreza; A. C. Wilkie.

The Department of Soil and Water Science offers the Master of Science and the Doctor of Philosophy degrees with emphasis on soil chemistry, soil genesis and classification, soil microbiology, soil physics, soil fertility, forest soils, and environmental quality. The research effort is organized into five general areas: (1) wetlands, (2) land application of nonhazardous wastes, (3) soil/water contamination and remediation, (4) soil/water agrochemical management, (5) rhizosphere dynamics. The nonthesis degree Master of Agriculture is also offered.

The interests of the student and faculty, the facilities, and the funding available will determine the area of specialization for the research problem. A specific program of study is prepared by an appointed supervisory committee for each student. Students will present a thesis or dissertation in their major field; in addition, Ph.D. candidates must pass a qualifying examination covering several areas of soil science and related fields.

Prerequisites.— Students who expect to do graduate work in the Department of Soil and Water Science should hold a bachelor's degree from an accredited college or university with a major in soil science or the equivalent background in another field of science. Graduate students should have backgrounds in biology, chemistry, physics, and mathematics and knowledge of basic soil science. Those students not meeting the above requirements will normally be expected to make up any deficiencies early in their graduate program. Students will also be held responsible for such basic undergraduate courses as are deemed necessary for the pursuit of their special programs.

CWR 6536—Stochastic Subsurface Hydrology (3) *Prereq: senior-level course in probability and statistics, calculus through differential equations, soil physics, and/or subsurface hydrology.* Stochastic modeling of subsurface flow and transport including geostatistics, time series analysis, Kalman filtering, and physically based stochastic models.

CWR 6537—Contaminant Subsurface Hydrology (3) *Prereq: MAP 3302 or 4314 or equivalent; COP 3210 or equivalent; SOS 4602 or AGE 6252 or CWR 5125 or 5127 or equivalent; SOS 4404 or EES 6208 or equivalent.* Physical-chemical-biological concepts and modeling of retention and transport of water and solutes in unsaturated and saturated media. Applications to environmental aspects of soil and groundwater contamination emphasized.

SOS 5132—Tropical Soil Management (3) *Prereq: SOS 3022.* Characteristics and management of tropical soils with emphasis on technologies which minimize industrial inputs.

SOS 5303C—Soil Microbial Ecology (3) *Prereq: SOS 3022, APB 2170.* Occurrence and activities of soil microorganisms and their influence on soil productivity and environmental quality.

SOS 5424C—Soil Chemical Analysis (3) *Prereq: SOS 4404, CHM 3120.* Practical and theoretical aspects of instrumentation and techniques commonly used in the analyses of soils and plants.

SOS 6136—Soil Fertility (3) *Prereq: SOS 4404.* Principles of advanced soil fertility, including soil chemical properties, crop management practices, plant nutritional requirements, soil fertility amendments, and physiological aspects of plant growth.

SOS 6161—Bioavailability of Soil Nutrients (3) *Prereq: SOS 3022, 4115, 4404, or equivalent.* Soil water regime, soil chemical reactions, and dynamic nature of root growth and root function as they influence and determine nutrient availability.

SOS 6323—Advanced Soil Microbiology (2) *Prereq: SOS 5303 or permission of instructor.* Study of form, function, and ecological relationships of microorganisms in plant-soil environments.

SOS 6325L—Soil Microbiology Laboratory (2) *Prereq: MCB 3020 and/or consent of instructor. Coreq: SOS 6323.* Laboratory experiments on soil-plant-microorganism relationships.

SOS 6448—Biogeochemistry of Wetland Soils (3) Biogeochemical cycles of carbon, nitrogen, phosphorus, sulfur, and redox cations in wetland soils and sediments, as related to their agronomic and ecological significance.

SOS 6454—Soil and Aquatic Physical Chemistry (3) *Prereq: CHM 3400, SOS 4404.* Fundamental principles of surface chem-

istry as applied to soil and subsurface materials in natural waters. Chemical equilibria in natural systems, aqueous geochemistry, interfacial properties of soil and sedimentary colloids, and sorption of pollutants.

SOS 6464C—Soil Mineralogy (4) *Prereq: GLY 6250, SOS 4404.* Composition and properties of soil minerals; techniques of identification and analysis of mixed mineralogical systems; relations of composite mineralogical characters to soil properties.

SOS 6622—Soil Physics (3) *Prereq: SOS 4602, 4404, MAC 3313, EGM 3311, or equivalent.* Physical concepts of the retention and movement of water, solutes, and gases in soils with a special emphasis on agricultural and environmental aspects of water and solute behavior in soils.

SOS 6717—Soil Genesis and Classification (3) *Prereq: SOS 4715.* Philosophic concept of soil, role of soil models, development and nomenclature of diagnostic horizons, and an analysis of soil taxonomy. Several field trips are required.

SOS 6752—Morphology of Florida Soils (1) *Prereq or coreq: SOS 4718.* Field studies relating the influence of morphological characteristics on the suitability of Florida soils for agricultural and urban uses. Extensive trips required.

SOS 6905—Special Problems (1-4; max: 8) *Prereq: 15 credits of soil science.* Laboratory, library, and/or field study and research in a particular aspect of soils. H.

SOS 6910—Supervised Research (1-5; max: 5) S/U.

SOS 6931—Seminar (1; max: 3) Presentation of literature, methods of proposed thesis research, and selected topics.

SOS 6932—Topics in Soils (1-4; max: 8) *Prereq: SOS 3022.*

SOS 6940—Supervised Teaching (1-5; max: 5) S/U.

SOS 6971—Research for Master's Thesis (1-15) S/U.

SOS 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.

SOS 7980—Research for Doctoral Dissertation (1-15) S/U.

SPECIAL EDUCATION
College of Education

GRADUATE FACULTY 1993-94

Chairperson: P. T. Sindelar. *Graduate Coordinator:* C. L. Reichard. *Professors:* V. I. Correa; M. K. Dykes; C. Forgnone *(Emeritus)*; C. D. Mercer; C. L. Reichard; S. E. Schwartz; P. T. Sindelar; W. D. Wolking. *Assistant Professors:* M. T. Brownell; C. C. Griffin; S. W. Smith.

The Department offers programs leading to the Master of Education or Master of Arts in Education degrees, the sixth year Specialist in Education degree, and the Doctor of Education or Doctor of Philosophy degrees. Program specializations include the emotionally disturbed, the mentally retarded, specific learning disabilities, physically impaired/multiply handicapped, and administration of special education. For the latter, students should see courses listed in this *Catalog* under *Educational Leadership:* EEX 6511—Administration of Special Education; EEX 7535—Seminar in Administration and Supervision of Special Education; EEX 7945—Practicum: Special Education Administration. In addition to area specializations, students may elect to emphasize handicapping conditions at developmental levels ranging from preschool through vocational levels. Students interested in specializing in speech-language pathology should see courses listed under Communication Processes and Disorders (for further information contact the Graduate Coordinator, 336 Dauer).

EED 6221—Educational Aspects of Behavioral Problems in Children and Youths (1-3; max: 3) *Prereq or coreq: EEX 3010, 6051.* An analysis of the emerging trends and procedures in providing services to children and youths who may be classified as having behavioral disorders. H.

EED 6241—Educational Programming for Children and Youths with Behavioral Problems (3) *Prereq: EED 4011 or 6221, EEX 3010 or 6051.* Structuring individualized remediation programs for children with behavioral disorders based upon psychoeducational evaluations. Curriculum materials and techniques to increase cognitive and affective dimensions of personal development. H.

EED 6943—Practicum in Special Education: Emotionally Disturbed (3-12; max: 12) *Prereq or coreq: EED 4011 or 6221 and written request prior to registration for permission to enroll.* Working with behaviorally disordered children and youths in a variety of settings.

EED 7930—Seminar: Program Development for Children with Behavioral Disorders (3) Latest innovations in special education media, models of information dissemination and their implications.

EEX 6051—Teaching Exceptional Children (3) Care, treatment, and education of children with problems and handicaps.

EEX 6065—Educational Programming at Secondary Level for Students with Disabilities (3) Curriculum materials and techniques appropriate for secondary programs for learners with handicaps.

EEX 6222—Evaluation in Special Education (3) *Prereq or coreq: prior experience with exceptional students; introductory courses in measurement, statistics. Enrollment in clinical practicum with exceptional students.* Issues and practices related to education assessment with special students.

EEX 6238—Clinical Teaching for Students with Learning Problems (3) *Prereq or coreq: prior experience with exceptional students; courses in teaching reading and math. Enrollment in clinical practicum with exceptional students.* Academic interventions and classroom management strategies for mildly handicapped learners.

EEX 6521—Organization and Program Planning in Special Education (3) *Prereq: EEX 6051 and consent of instructor.* Control and management of special education programs, with emphasis on curriculum development based on needs assessment and evaluation.

EEX 6605—Data-Managed Behavioral Decisions (3) Managing daily teaching and learning decisions with data to optimize pupil learning, precision teaching, behavior analysis, and criterion-referenced assessment.

EEX 6786—Transdisciplinary Services for Exceptional Students (3) *Prereq or coreq: EGC 4033 and permission of instructor; EEX 6786L or prior experience with exceptional students.* Roles of related services personnel and development of skills for consulting with parents, peers, and specialists serving exceptional students.

EEX 6786L—Laboratory: Transdisciplinary Services for Exceptional Students (3) *Prereq: EGC 4033. Coreq: EEX 6786 and permission of the instructor.* Supervised practicum in consulting and conferences with teachers, parents, and specialists serving exceptional students.

EEX 6863—Supervised Practice in Special Education (12) *Prereq: approval of special education faculty in area of specialization and Office of Student Teaching.* Supervised teaching in selected school settings designed to serve children and youths who have been classified as having behavioral and/or learning problems. Seminars and continuous evaluation of teaching experiences. S/U.

EEX 6905—Individual Work (1-4; max: 12) *Prereq: consent of department chairperson, approval of proposed project, and completion of at least 9 hours of graduate work.*
EEX 6910—Supervised Research (1-5; max: 5) S/U.
EEX 6932—Seminar: Single Case Experimental Research (3)
EEX 6936—Special Topics (1-3; max: 12) *Prereq: consent of department chairperson.*
EEX 6940—Supervised Teaching (1-5; max: 5) S/U.
EEX 6971—Research for Master's Thesis (1-15) S/U.
EEX 7865—Internship: Special Education (1-12; max: 12)
EEX 7930—Seminar in Special Education (3; max: 12) *Admission limited to advanced degree students in special education.* Consideration of current problems.
EEX 7934—Seminar: Trends in Special Education (3) *Admission limited to advanced degree students in special education.* Emphasis on trends in special education and future considerations for research, and local, state, and federal priorities.
EEX 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.
EEX 7980—Research for Doctoral Dissertation (1-15) S/U.
EGI 6051—Education of the Gifted Child (3) Definitions of giftedness, characteristics of gifted children, and outside-of-school influences which affect achievement of gifted children.
EGI 6245—Program Development for the Gifted (3) School programs for the gifted. Educational provisions for the achieving and underachieving gifted individual.
ELD 6015—Foundations in the Field of Specific Learning Disabilities (3) Definitions, history, contributors, theories, issues, instructional strategies, delivery systems, and trends in the field.
ELD 6936—Seminar: Current Literature in Specific Learning Disabilities (1; max: 6)
ELD 6937—Seminar: Identification and Remediation of Specific Learning Disabilities (3) Recent literature on identification, remediation, and learning strategy intervention programs.
ELD 6944—Practicum in Special Education: Special Learning Disabilities (1-12; max: 12) *Written request is required six weeks prior to registration.* Includes supervised field experiences with children with specific learning disabilities. Supervision consists of direct observation, group sessions, individual consultation, and quantified feedback on teaching effectiveness.
ELD 7938—Seminar: Advanced Topics in Learning Disorders (3-9; max: 9) *Prereq: ELD 6015.* Review of selected literature and formulation of research problems in the area of learning disorders and instruction.
EMR 6361—Education of the Mentally Retarded (3) *Prereq: consent of instructor.* Educational provisions for the retarded affected by environmental deprivation and sensory and other impairment.
EMR 6801—Practicum in Special Education: Mental Retardation (3-9; max: 9) *Prereq: EMR 6361 and written request six weeks prior to registration.* Tutoring mentally retarded children in educational situations appropriate to the student's professional goals.
EMR 7936—Seminar: Mental Retardation (3) *Prereq: EMR 3011 or 6361.* Theoretical implications of mental retardation for intelligence, environment, and behavior.
EPH 6005—Laboratory in Special Education Assessments of Severely Handicapped Children (1-3; max: 3) *Prereq: EEX 6051, 6222, EED 6241, or 6936. Open only to advanced students in special education.* Assessment techniques, evaluation programs, and prescriptive work.
EPH 6321—Educational Management of the Physically Impaired/Multiple Handicapped (1-3; max: 3) *Prereq or coreq: EEX 6051, EPH 6395, 6005, 6942.* Programming and evaluation for young children with physical impairments/multiple handicaps, including curriculum, materials.
EPH 6355—Education of Severely Handicapped Children (1-3; max: 3) *Prereq: EEX 6051 or equivalent and consent of instructor.* Educational procedures and modifications required for children and youths with physical impairments including sensory, neurological, skeletal, and muscular problems. H.
EPH 6395—Physiological Aspects of Physical/Multiple Handicaps (1-3; max: 3) *Prereq or coreq: EEX 6051.* Educational implications and programming modifications required by physical/multiple handicaps. Relationships between educational programming and pathologies of central nervous systems-motor sensory, language, and psychological disorders. H.
EPH 6942—Practicum in Special Education: Physically Impaired/Multiple Handicapped (3-9; max: 9) *Prereq or coreq: EEX 6051, EPH 6355, and written request six weeks prior to registration.* Evaluation and programming for children in PI/MH programs in various settings.
EPH 7937—Seminar: Education of Physically Impaired/Multiple Handicapped Children in Public Schools (1-3; max: 3) Evaluation of current research on the education of children in public schools for the PI/MH.
SPS 7949—Internship in School Psychology (6; max: 18) *Prereq: 4 credits of EGC 7446 and written application to internship coordinator at least six weeks in advance of registration; open only to students officially enrolled in the school psychology program.*

STATISTICS
College of Liberal Arts and Sciences

GRADUATE FACULTY 1993-94

Chairman: R. H. Randles. *Graduate Coordinator:* M. N. Chang. *Professors:* A. G. Agresti; R. L. Carter; J. A. Cornell; M. Ghosh; A. I. Khuri; R. C. Littell; R. G. Marks; F. G. Martin; R. H. Randles; P. V. Rao; A. Rosalsky; R. L. Scheaffer; J. J. Shuster; D. D. Wackerly; M. C. K. Yang. *Associate Professors:* J. G. Booth; M. Chang; R. G. O'Brien; K. M. Portier; G. Vining. *Research Associate Professors:* M. Conlon; J. A. Pendergast. *Assistant Professor:* B. Presnell.

Graduate programs are available leading to Master of Science in Statistics, Master of Statistics, and Doctor of Philosophy degrees. Both master's programs usually require two years of course work including material covered in STA 6207, 6208, 6326, 6327, 6246, 6247. Students wishing an emphasis in biostatistics are not required to take STA 6247 but must take STA 6176, 6177. In addition to passing the master's comprehensive examination, requirements for the Ph.D. degree include STA 6466, 6467, 7346, 7347, and MAA 5228.

STA 5106—Computer Programs in Statistical Analysis (1) *Prereq: STA 4212 or 6166.* Utilization of library computer programs for analysis of balanced experimental data and regression analysis.
STA 5325—Mathematical Methods of Statistics (3) *Prereq: MAC 3313 or equivalent.* Topics in probability and statistics, particularly discrete and continuous random variables, sampling distributions, estimation, and hypothesis testing. Applications to engineering and natural science.
STA 6126—Statistical Methods in Social Research I (3) Descriptive statistics, estimation, significance tests, two-sample comparisons, methods for nominal and ordinal data, regression and correlation, introduction to multiple regression.
STA 6127—Statistical Methods in Social Research II (3) *Prereq: STA 6126.* Further topics in multiple regression, model building, analysis of variance, analysis of covariance, multivariate analysis of categorical data.

STA 6166—Statistical Methods in Research I (4) Statistical inference based on t, F, and X" tests. Analysis of variance for basic experimental designs. Factorial experiments. Regression analysis and analysis of covariance.

STA 6167—Statistical Methods in Research II (4) *Prereq: STA 6166.* Analysis of split-plot and nested designs with incomplete blocks, confounding and fractional replications. Analysis of count data. Nonparametric methods.

STA 6176—Introduction to Biostatistics (3) *Prereq: STA 6207, 6326.* Analysis of epidemiological studies, measures of morbidity and mortality, methods for rates and proportions, bioassay, longitudinal data analysis.

STA 6177—Advanced Topics in Biostatistics (3) *Prereq: STA 6176.* Survival analysis, Kaplan-Meier estimates, proportional hazards model, related tests, phase I, II, and III clinical trials, designs and protocols.

STA 6200—Fundamentals of Research Design (2) Choosing the research objective, determining the type of data to collect, repeated measures and blocking, choosing the sample and the randomization technique, designing a data collection form. Applications to biomedical data.

STA 6201—Analysis of Research Data (3) *Prereq: STA 6200.* Introduction to the most commonly used statistical analyses for evaluating research data, with application to the biomedical sciences. Emphasis on choosing the appropriate procedure and evaluating the results properly, rather than on the computational aspects of the procedures.

STA 6207—Applied Statistical Methods (3) *Prereq: STA 4322.* Overview of normal theory inference, nonparametric, and categorical data methods; basic concepts of experimental design; analysis of variance; introduction to factorial and nested experiments.

STA 6208—Regression Analysis (3) *Prereq: STA 6207.* Simple linear regression; multiple regression; model selection residual analysis; influence diagnostics; multicollinearity; ANOVA and regression; generalized linear models; nonlinear regression.

STA 6209—Design and Analysis of Experiments (3) *Prereq: STA 6208.* Tests of assumptions; block designs; control of two-way heterogeneity; cross over designs; factorial experiments; fractional factorials; analysis of "messy" data.

STA 6226—Sampling Theory and Application (3) *Prereq: STA 6327 or consent of instructor.* Theory and application of commonly used sampling techniques; simple random sample, cluster, ratio, regression, stratified, multistage, and systematic samples. Special topics include wildlife surveys, non-sampling error adjustment, categorical data analysis, and practical survey examples.

STA 6246—Theory of Linear Models (3) *Prereq: STA 6208, 6327, 6329.* Theory for analysis of linear models in univariate data; distributions of quadratic forms; full rank linear models; fixed effect models of less than full rank; balanced random and mixed models; unbalanced random and mixed models.

STA 6247—Advanced Topics in Design and Analysis (3) *Prereq: STA 6246, 6207-6209.* First and second order response surface designs and models. The objectives of a response surface investigation. The determination of optimum conditions for response surface models. The integrated mean square error criterion for the choice of a design. Minimum bias estimation designs. The analysis of multiresponse experiments. Designs for nonlinear models. Some advanced topics in unbalanced mixed models.

STA 6267—Sequential Methods (3) *Prereq: STA 6327.* Double sampling procedures, the sequential probability ratio tests, sequential tests for composite hypotheses, sequential estimation and confidence intervals.

STA 6326—Introduction to Theoretical Statistics I (3) *Prereq: MAC 3313.* Theory of probability. Probability spaces, continuous and discrete distributions, functions of random variables, multivariate distributions, expectation, conditional expectation, central limit theorem, useful convergence results, sampling distributions, distributions of order statistics, empirical distribution function.

STA 6327—Introduction to Theoretical Statistics II (3) *Prereq: STA 6326.* Estimation and hypothesis testing. Sufficiency, information, estimation, maximum likelihood, confidence intervals, uniformly most powerful tests, likelihood ratio tests, sequential testing, univariate normal inference, decision theory, analysis of categorical data.

STA 6329—Statistical Applications of Matrix Algebra (2) *Prereq: MAC 3313, STA 6208.* Basic theory of determinants, inverses and generalized inverses, eigenvalues and eigenvectors; applications of partitioned matrices; diagonalization and decomposition theorems; applications in least squares.

STA 6466—Probability Theory I (4) *Prereq: MAA 5228 or equivalent.* Measure and probability spaces; random variables; distribution functions; abstract Lebesgue and Stieltjes integration; monotone; dominated, Cauchy, and mean convergence; Fubini and Radon-Nikodym theorems; zero-one laws.

STA 6467—Probability Theory II (4) *Prereq: STA 6466.* Summability of independent random variables, laws of large numbers, convergence in distribution, characteristic functions, uniqueness and continuity theorems, the Lindeberg-Feller central limit theorem, degenerate convergence criterion.

STA 6505—Analysis of Categorical Data (3) *Prereq: STA 6327 and 6207 or consent of instructor.* Varieties of categorical data, cross-classification tables, tests for independence. Measures of association. Loglinear models for multi-dimensional tables. Logit models and analogies with regression. Specialized methods for ordinal data.

STA 6526—Nonparametric Statistics (3) *Prereq: STA 6327 or consent of instructor.* Inference based on rank statistics—one, two and k-sample problems, correlation and regression problems and analysis of contingency tables. Conditionally distribution-free rank tests. Pitman asymptotic relative efficiency.

STA 6576—Theory of Nonparametric Statistics (3) *Prereq: STA 6526 or consent of instructor.* Theoretical foundations of nonparametric statistics: theory of U-statistics, Noether's theorem and Pitman asymptotic relative efficiency, estimation and hypothesis testing with one and two sample (scale) models, theory of linear rank statistics, applications to general linear models analyses.

STA 6662—Statistical Methods for Industrial Practice (3) *Prereq: statistical theory of distributions, basic analysis of variance; coreq: theory of statistical estimation and testing.* Statistical techniques used in modern industry, including variance components analysis, control charting, estimation of process characteristics, evolutionary operation, fraction, factorials, screening experiments.

STA 6706—Applied Multivariate Methods for Behavioral Research (3) *Prereq: STA 6166 or consent of instructor.* Bivariate relationship: matrix algebra; review of multiple regression and correlation; part and partial correlation; canonical correlation; discriminant analysis and classification; cluster analysis; factor analysis.

STA 6707—Analysis of Multivariate Data (3) *Prereq: STA 6808 and facility in a computer language.* Techniques for analyzing multivariate data. Emphasis on MANOVA and tests on the structure of the dispersion matrix. Topics will include discriminant, factor, profile, and cluster analyses.

STA 6746—Multivariate Analysis (4) *Prereq: STA 6246 or consent of instructor.* Singular transformations and the generalized Jacobian. The multivariate normal distribution, Wishart distribution, and the U distribution. Distribution of the latent roots of one Wishart matrix in the metric of another. Noncentral counterparts of these distributions—an introduction to zonal polynomials. Distributions of variables constrained to lie on a sphere or a simplex. The resultant and its usage in analysis of directional data.

STA 6826—Stochastic Processes I (3) *Prereq: STA 6377.* Discrete time and state Markov process. Ergodic theory.

STA 6827—Stochastic Processes II (4) *Prereq: STA 6826.* Continuous time Markov processes. The Poisson and allied processes. The Kolmogorov equations. Renewal theory.

STA 6857—Applied Time Series Analysis (3) *Prereq: STA 4322 and a basic computer language.* Linear time series model building,

spectral density estimation, analysis of nonstationary data, SAS package on Box and Jenkins model building and forecasting. Case studies in recent literature will be discussed.

STA 6876—Theory of Time Series (3) *Prereq: STA 6327.* Foundations of stationary time series, distributions of sample autocorrelations, partial autocorrelation, spectral density, time series regression, and special topics in recent time series research.

STA 6900—Problems in Statistics (1-4; max: 6) *Prereq: permission of department.* Special problems in research methods, sampling methods, and experimental designs.

STA 6905—Individual Work (1-4; max: 10) *Prereq: permission of department.* Special topics designed to meet the needs and interests of individual students.

STA 6910—Supervised Research (1-5; max: 5) S/U.

STA 6934—Special Topics in Statistics (1-3; max: 8) *Prereq: permission of graduate adviser.*

STA 6937—Seminar: Current Topics in Statistics (1-3; max: 6) *Prereq: permission of department.* Discussion of current research topics in statistics not covered in regular courses. S/U.

STA 6938—Seminar (1; max: 15) *Prereq: permission of department.* Special topics of an advanced nature suitable for seminar treatment but not given in regular courses. S/U.

STA 6940—Supervised Teaching (1-5; max: 5) S/U.

STA 6971—Research for Master's Thesis (1-15) S/U.

STA 7346—Statistical Inference I (4) *Prereq: STA 6327.* Decision rules and risk functions. Sufficiency, Minimax, and Bayes rules for estimation of location and scale parameters.

STA 7347—Statistical Inference II (4) *Prereq: STA 7346.* Bayesian statistical inference. Inference using large samples. Relative efficiencies of tests and estimates with special reference to Pitman and Bahadur efficiencies.

STA 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.

STA 7980—Research for Doctoral Dissertation (1-15) S/U.

TAXATION
College of Law

GRADUATE FACULTY 1993-94

Director & Graduate Coordinator: M. K. Friel. *Culverhouse Eminent Scholar in Taxation:* L. L. Lokken. *Distinguished Service Professor:* J. J. Freeland. *Professors:* K. G. Anderson; D. A. Calfee; B. A. Currier; M. K. Friel; D. M. Hudson; S. A. Lind; M. A. Oberst; D. M. Richardson; S. J. Willis; G. Yin.

Graduate study in the field of taxation leading to the degree Master of Laws in Taxation is available in the College of Law. Applicants for admission to the Graduate School for this degree must hold a law degree from an accredited law school but need not submit scores on the Graduate Record Examination. For further information concerning admission consult the *College of Law Catalog,* or write the Tax Office, 320 Holland Law Center.

LAW 7602—Income Taxation I (3) Tax problems of individual taxpayers; concepts of gross income, deductions, identification of taxpayer. Problems incident to the sale, exchange, and other disposition of property, including recognition and characterization concepts.

LAW 7604—Income Taxation II (2) Income tax accounting principles; the taxable year, accounting methods, installment and deferred payment sales, delayed payment for services, income averaging, and loss carryovers and carrybacks.

LAW 7607—Income Taxation of Natural Resources (2) Examination of the federal income taxation of the extractive industries (oil and gas, solid minerals) and timber; classification and consequences of conveyance transactions; cost and percentage depletion; geological and geophysical costs; intangible drilling and development costs; mine exploration and development expenditures.

LAW 7611—Corporate Taxation (3) Tax considerations in corporate formations, distributions, redemptions, and liquidations, including Subchapter C and Subchapter S corporations. Some general consideration of tax alternatives relating to the sales of corporate businesses.

LAW 7612—Advanced Corporate Taxation (2) Advanced problems including Subchapter S corporations, professional corporations, personal holding companies and punitive taxes on earnings accumulation, collapsible corporations, and corporate tax planning.

LAW 7613—Corporate Reorganizations (2) Reorganizations: mergers, consolidations, and division, including transfer or inheritance of losses and other tax attributes.

LAW 7614—U.S. Taxation of Foreign Persons and Incomes (2) Applications of the federal income tax to nonresident aliens and foreign corporations and to United States citizens, residents, and corporations investing funds abroad or conducting business with foreign persons.

LAW 7617—Partnership Taxation (3) Tax meaning of "partnership"; formation transactions between partner and partnership, determination and treatment of partnership income; sales or exchange of partnership interest; distributions; retirement; death of a partner, drafting the partnership agreement.

LAW 7623—Taxation of Gratuitous Transfers (2) Federal taxes on estates and gifts and generation-skipping transfers.

LAW 7625—Income Taxation of Trusts and Estates (2) Taxation on income of trusts and estates, with emphasis on income required to be distributed currently, equivocal distributions of income or corpus, and accumulation distributions; other fiduciary tax problems, including the treatment of income in respect of decedents.

LAW 7626—Estate Planning (2) Estate planning; planning lifetime and testamentary private and charitable dispositions of property, postmortem planning; life insurances; analysis of small and large estates; eliminating and offsetting complicating and adverse factors; selection of a fiduciary and administrative provisions.

LAW 7632—Deferred Compensation (2) Tax consequences of compensation in forms other than cash paid contemporaneously with performance of services. Users of employers' stock in employee compensation, nonqualified deferral compensation devices, and qualified pension and profit-sharing plans.

LAW 7633—Tax Exempt Organizations (2) Study of exemption from federal income tax accorded to a variety of public and private organizations, and tax treatment of contributions to such organizations; public policies underlying exemption from tax, and deductibility of contributions; and the broad new enforcement powers to be undertaken by the Internal Revenue Service.

LAW 7640—Civil Tax Procedure (3) Taxpayer's relationships with the Internal Revenue Service, including requests for rulings; conference and settlement procedures; deficiencies and their assessment; choice of forum; Tax Court practice; limitation periods and their mitigation; transferee liability tax liens; and civil penalties.

LAW 7641—Procedures in Tax Fraud Cases (2) Criminal offenses and methods of proof; investigative authority of the IRS; summons enforcement proceedings; search warrants and grand jury subpoenas; constitutional defenses to the compulsory production of evidence; the attorney-client privilege and other objections available to taxpayers and third parties.

LAW 7650—State and Local Taxation (2) Nature and purpose of state taxation, comparison of property and excise taxes; uniformity of taxation; jurisdiction; assessment and collection procedures; remedies available to taxpayers.

LAW 7905—Independent Study (1-3; max: 4) S/U.

LAW 7910—Supervised Research (1-5; max: 5) S/U.
LAW 7911—Federal Tax Research (1-2; max: 2) Substantial research and writing project on a federal tax subject; instruction in tax research techniques. Students customarily register for the course and complete the project during two successive semesters. Credit is usually one hour each semester but may be varied in accordance with scope and nature of project. H.
LAW 7931—Current Federal Tax Problems (2; max: 4) Either significant new legislation or significant developments within the existing statutory framework; emphasis on policy considerations.
LAW 7940—Supervised Teaching (1-5; max: 5) S/U.

THEATRE
College of Fine Arts

GRADUATE FACULTY 1993-94

Chair: J. W. B. Williams. *Graduate Program Advisers:* D. L. Conway (Design Technology); D. L. Shelton (Performance). *Professors:* S. R. Homan; A. F. C. Wehlburg; J. W. B. Williams. *Associate Professors:* R. Brandman; R. Rose; D. L. Shelton. *Assistant Professors:* C. Furr; H. Hollingsworth; T. M. Pender; J. Schneider.

The graduate program offered by the Department of Theatre leads to the degree of Master of Fine Arts. The degree prepares students for professional entry in performance, production, or teaching.

Placement in the MFA program is determined by audition/portfolio review, academic credentials, diagnostic testing, and personal interview.

The program combines graduate students in a company intent on the study and practice of theatre as an art and discipline. Students of acting and design study concepts of theatre together while working in their areas of specialization. Focus is on the collaboration and synthesis of theatre artistry. Each incoming class admits approximately 10 students with 9 graduate faculty.

The student's artistic and academic progress will be reviewed at the end of each semester. The *Department of Theatre Handbook* gives details on the form and focus of each review.

At the beginning of Semester IV, each student must successfully complete the comprehensive examination and oral defense. The project in lieu of thesis includes research, analysis, rehearsal process, and evaluation. Development and execution of the project includes public performance (acting or design). The written document and oral defense of the project which follow must demonstrate the ability to communicate the creative process.

Graduate students must audition for all departmental productions. All graduate students, undergraduates, and faculty meet for required departmental meetings.

THE 6270—Seminar in Period Styles (3) *Prereq: THE 6565.* Research and analysis of various historical periods as foundations for the creative process; preparation and performance.
THE 6525—History, Literature, and Criticism I (3) *Coreq: TPP 6115, 6285.* Historical development of dramatic literature and criticism from Aristotle through Goethe.
THE 6526—History, Literature, and Criticism II (3) *Prereq: THE 6525; coreq: TPP 6116, 6286.* Historical development of dramatic literature and criticism from Nietzsche through the modern period.
THE 6565—Seminar in Creative Process (3) *Prereq: THE 6745; coreq: TPP 6237.* Specialists in all areas of theatre explore the similarities in their creative thinking and methods.
THE 6745—Seminar in Teaching Theatre (3) Educational techniques and aesthetic principles applied to the teaching of theatre in higher education.
THE 6905—Individual Study (1-8; max: 8) *Prereq: consent of instructor.* Reading, research, or performance project.
THE 6910—Supervised Research (1-5; max: 5) *Prereq: consent of instructor.* S/U.
THE 6940—Supervised Teaching (1-5; max: 5) S/U.
THE 6941—Internship (1-9; max: 9) *Prereq: TPP 6238.* Practical experience in residence with a professional theatre or equivalent. S/U.
THE 6950—Applied Theatre (1-3; max: 9) Specialized practical experience achieved through participation in realized productions.
THE 6955—Summer Repertory Theatre (3-9; max: 9) *Prereq: consent of instructor.* Practical experience in repertory theatre with direct skills application in all areas of theatre production.
THE 6971—Research for Master's Thesis (1-15) S/U.
THE 6973—Project in Lieu of Thesis (1-9; max: 9) *Prereq: admission to candidacy.* Creative project in lieu of written thesis. S/U.
TPA 6005—Design I (3) Application of fundamental techniques of set, light, and costume design as applied to various styles of dramatic literature.
TPA 6006—Design II (3) *Prereq: TPA 6005.* Experience in design under simulated production conditions. Designers working in their major and minor areas of specialization.
TPA 6019—Professional Seminar: Design (3) *Prereq: TPP 6238.* Techniques and methods of design execution for film, television, and theatre.
TPA 6068—Experimental Design Techniques (3) *Prereq: TPA 6298.* Traditional solutions and exploration of innovative techniques for execution of period, fantasy, and departure-from-realism design.
TPA 6298—Crafts Workshop (3) Refinement of construction skills as the foundation for execution of design. Period and contemporary work.
TPP 6115—Acting I (3) *Coreq: THE 6525, TPP 6285.* Experimentation and experience in psychological realism: analysis, technical skills, and contacting the emotions.
TPP 6116—Acting II (3) *Prereq: TPP 6115; coreq: THE 6526, TPP 6286.* Experimentation and experience in nontraditional and period plays: analysis, research, and technical skills.
TPP 6225—Professional Seminar: Acting (3) *Prereq: TPP 6238 or consent of instructor.* Techniques and methods of performance for film, television, theatre.
TPP 6237—MFA Company Acting Workshop I (1-6; max: 6) *Prereq: TPP 6116; coreq: THE 6565, TPP 6385.* Student actors study, experiment, and produce in laboratory emphasizing specialized skills and methods; emphasis on contemporary realism.
TPP 6238—MFA Company Acting Workshop II (1-6; max: 6) *Prereq: TPP 6237; coreq: THE 6270.* Building on TPP 6237, student actors study, experiment, and produce in laboratory; emphasis on nonrealistic and period genres.
TPP 6285—Voice and Movement I (3) *Coreq: THE 6525, TPP 6115.* Vocal skills with emphasis on versatility, production, power, and strength.
TPP 6286—Voice and Movement II (3) *Prereq: TPP 6285; coreq: THE 6526, TPP 6116.* Physical and vocal skills unique to the execution of nontraditional and period roles.
TPP 6385—Directing (3) *Prereq: TPP 6115 or TPA 6005; coreq: TPP 6237.* Exploration of the philosophy and psychology of directing and the director. Applied to scene study.

URBAN AND REGIONAL PLANNING
College of Architecture

GRADUATE FACULTY 1993-94

Chairman: J. M. Stein. *Graduate Coordinator:* O. F. Wetterqvist. *Professors:* J. F. Alexander, Jr.; J. C. Nicholas; J. M. Stein; W. L. Weismantel. *Associate Professors:* R. H. Schneider; O. F. Wetterqvist. *Associate Scientist:* P. D. Zwick. *Assistant Professor:* I. Audirac.

The College of Architecture offers a program leading to the Doctor of Philosophy degree in architecture. Areas of specialization within this program include architecture, building construction, and urban and regional planning.

The Department of Urban and Regional Planning offers graduate work leading to the degree of Master of Arts in Urban and Regional Planning (M.A.U.R.P.). Students are encouraged to enter the program in the fall semester. The program is usually completed in two academic years. The student entering with an undergraduate degree and no graduate study must complete 52 hours of credit for the M.A.U.R.P. degree. Students who have earned graduate credit in related fields in the University of Florida may transfer up to 18 semester hours toward the 52 hour requirement. Such a transfer of credit requires the approval of the Department. The Department encourages students with any undergraduate degree who are interested in the field of planning to apply for admission.

Applications for admission must be received 90 days prior to the beginning of the semester during which the applicant wishes to enter the program. The Registrar's Office will notify applicants of acceptance at least 45 days before the semester begins. The Department will notify applicants of rejection at least 45 days before the semester begins.

The urban and regional planning curriculum is designed to provide a set of core studies and contextual projects which prepare the graduate for the practice of planning in public or private agencies at both national and international levels. The core studies include history and theory of planning; plan making and growth management at local, regional, and state levels; design for planners; and related studies in community and regional social, natural, and economic systems. Contextual projects include, among many subject areas, urban design, special district planning, regional planning, community redevelopment and preservation, housing, real estate, and economic development. The program emphasizes planning, policies, and design for the physical environment. Current specializations include growth management; planning/geographic information systems; real estate/development; urban design; and housing, community, and economic development. Students are also encouraged to take advantage of the extensive faculty, course offerings, and other resources available in the College of Architecture and throughout the University. The Department has two research centers: The Geofacilities Planning and Information Center and the Center for Community Redevelopment.

The curriculum is supported by adequate studio and individual study space in close proximity to architectural and landscape architecture laboratories, an extensive computer laboratory, and a visual aid library. Variation from the core studies may be approved by the Department if the student can demonstrate education and experience to the faculty which would support such an alternative. The M.A.U.R.P. degree is accredited by the Planning Accreditation Board, a joint undertaking of the American Institute of Certified Planners and the Association of Collegiate Schools of Planning, for having achieved the highest applicable standards for graduate education in the field of planning. Graduates of the Department are prepared to practice urban and regional planning.

The Department of Urban and Regional Planning and the College of Law offer a concurrent degree program. Admission to the joint degree program must be simultaneous. In addition, the Department along with the Department of Architecture offers a specialization in planning and community conservation. Areas of concentration with other programs in the Graduate School may be developed to meet the individual needs of students.

In addition to course work the student is required to complete an internship with a public or private planning office and the student must complete a thesis or terminal project. The department reserves the right to retain student work for purposes of record, exhibition, or instruction.

ARC 6644—Modeling Techniques in Architectural Acoustics (3) Theory and practice of ultrasonic, computer, and other techniques used to model human subjective response to sound and their application in the design of buildings.

ARC 7790—Doctoral Core I (3) Philosophy, theory, and history of inquiry into the processes of design, urban development, and building systems.

ARC 7792—Doctoral Core II (3) *Prereq: ARC 7790.* Urban, environmental, and legal systems in the context of urban development.

ARC 7794—Doctoral Seminar (1; max: 4) Current planning, architecture, development, and construction theories.

ARC 7911—Advanced Architectural Research I (3) *Prereq: STA 6167.* Architectural, planning, and construction research design with relevant mathematical and computer methods.

ARC 7912—Advanced Architectural Research II (3) *Prereq: ARC 7911.* Conduct of research in architecture, planning, and construction.

ARC 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study of for students who have been admitted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.

ARC 7980—Research for Doctoral Dissertation (1-15) S/U.

URP 6042—Urban and Regional Systems (3) Theory of urban and regional areas, trade, and growth.

URP 6061—Planning Administration and Ethics (3) Administration and management of public and private planning offices; ethics of planning profession.

URP 6100—Planning Theory and History (3) History of planning and the associated development of theory. Synoptic versus disjointed incrementalism and the political setting for comprehensive planning are emphasized.

URP 6101—Planning and Design I (3) Lectures, readings, and exercises in planning research and design methods. Emphasis on design graphics and other means of communication.

URP 6102—Planning and Design II (3; max: 6) Advanced lectures, readings, and exercises in planning research and design methods. Emphasis on urban and regional planning design problems. The focus may vary and will be determined by prospective students and the instructor.

URP 6103—Urban Design and Special District Planning (3) *Prereq: URP 6101.* Explores the practice of urban design and

special district planning. Emphasis on applied methods, case studies, and synthesis of form.

URP 6131—Growth Management Powers I (3) Introduction to regulatory and nonregulatory techniques of plan implementation. Relationship of law and politics to the planning process. Police power as the basis for regulation. Mandatory planning and status of adopted comprehensive plans.

URP 6132—Growth Management Powers II (3) *Prereq: URP 6131.* Traditional and innovative approaches to the control of land use. Zoning, subdivision regulation, and other land use control codes. Growth management in modern context.

URP 6141—Comprehensive Planning and Evaluation (3) Lectures, readings, and field experiences. Analysis of comprehensive planning tasks and methods of plan evaluation, often using regional or river basin, Caribbean, Latin American, and Florida case studies.

URP 6231—Planning Methods I (3) Planning problem formulation, quantitative and qualitative research skills, and data gathering techniques. Case study and survey methods. Statistical analysis and emphasis on computer applications.

URP 6261—Planning Methods II (3) *Prereq: URP 6231.* Advanced quantitative and qualitative methods for planners; emphasis on large-scale data files and computer graphics.

URP 6271—Planning Information Systems (3) *Prereq: URP 6261.* Advanced work in planning and analysis using large data bases with emphasis on development monitoring systems and information systems in planning.

URP 6272—Advanced Planning Information Systems (3) *Prereq: URP 6271.* Theoretical and practical knowledge about the structure, use, and architecture of georeference data base systems. Discussion of spatial relationships which exist between network and area related systems. Development and maintenance of geographic information systems as related to urban and regional planning.

URP 6312—Land Development Planning and Evaluation (3) Standards, criteria, policies, design techniques, and research systems used in designating proposed general distribution; location and extent of the uses of land and of population densities for all public and private land use categories as established by law, regulation, and social and economic justification at all levels of government in the U.S. and abroad.

URP 6315—Special District Project (1-12; max: 12) Examination of planning for districts such as historic, town centers, or special neighborhood redevelopment projects. H.

URP 6341—Urban Planning Project (1-12; max: 12) Projects encompass city wide comprehensive planning examining the interaction of urban and social systems cast in scenarios of future growth and development. H.

URP 6421—Environmental Impact Statements (3) Management and decision-making aspects of impact statements under the U.S. Environmental Protection Act, Florida's Land and Water Management Act of 1972, and as a component of a comprehensive planning process.

URP 6541—Economic Development Planning (3) Major international and national economic development theory, issues and trends as they affect local economic development planning, methods, and practice.

URP 6542—Land Use and Economic Development (3) Review of land economics within the context of urban and regional planning.

URP 6543—Seminar in Capital Improvement Finance (1) Methods and means of local government finance of capital improvements.

URP 6601—State Planning (3) History, development, and administration of state planning in the twentieth century with emphasis on recent growth management initiatives.

URP 6700—The Capital Web (3) Determining location, size, and appearance of community facilities, circulation, and utilities networks; the city as private investments and activities attached to the deliberately arranged, commonly owned capital web.

URP 6745—Housing, Public Policy, and Planning (3) Supply, demand, and market interrelationships. History of government housing policy. Exploration of relationship between housing policy and urban/regional planning.

URP 6821—Urban and Regional Systems (3) A quantitative computer-assisted exploration of a comprehensive planning model.

URP 6884—Community Conservation and Revitalization (3) Community conservation is a major thrust of National Urban Policy. Relates community revitalization and conservation to the methodology of identification of problem areas, planning and replanning for all types of locations, use and adaptive uses. Federal and state assistance, tax incentives, and other programs.

URP 6905—Exploration and Directed Study (1-4; max: 10)

URP 6910—Supervised Research (1-5; max: 5) S/U.

URP 6911—Planning Research Design (1-3; max: 3) Emphasis on research design, literature research; student presentations at appropriate stages in thesis work. S/U.

URP 6920—Colloquium (1) Introduction to field; historical, philosophical concepts, processes, issues related to profession of planning. For entering MAURP students. S/U.

URP 6931—Topical Seminar (1-4; max; 6) Current planning opportunity examined.

URP 6932—Seminar in Urban Planning (1) Introduction to field; historical, philosophical concepts, processes, issues related to profession of planning. S/U.

URP 6940—Supervised Teaching (1-5; max: 5) S/U.

URP 6941—Urban Planning Internship (3) Off-campus internship experience. S/U.

URP 6971—Research for Master's Thesis (1-15) S/U.

URP 6979—Terminal Project (1-6; max: 6) This option, in lieu of thesis, accommodates a physical design or plan project which because of its map and graphic content does not fit comfortably within a thesis format. S/U.

VETERINARY MEDICAL SCIENCES
College of Veterinary Medicine

GRADUATE FACULTY 1993-94

Associate Dean for Research and Graduate Studies: P. C. Kosch. *Graduate Coordinators:* C. L. Chen; D. J. Forrester; J. K. Yamamoto; T. J. Wronski. *Eminent Scholar:* P. J. Reier. *Professors:* N. Ackerman; L. F. Archbald; A. C. Asbury; A. F. Barbet; L. Belardinelli; M. S. Bloomberg; R. K. Braun; M. P. Brown; C. D. Buergelt; M. J. Burridge; C. F. Burrows; D. D. Buss; P. T. Cardeilhac; W. L. Castleman; C. D. Chen; C. L. Chrisman; C. H. Courtney; M. Drost; D. J. Forrester; K. N. Gelatt; E. P. J. Gibbs; E. C. Greiner; R. R. Gronwall; J. W. Harvey; J. A. Himes; E. R. Jacobson; P. A. Klein; P. C. Kosch; G. A. Kunkle; P. J. Laipis; N. K. Maclaren; A. M. Merritt; R. D. Miles; A. F. Moreland; J. T. Neilson; P. L. Nicoletti; A. B. Peck; V. M. Shille; E. K. Wakeland; A. I. Webb; J. C. Woodard; M. D. Young. *Associate Professors:* K. J. Anderson; R. J. Bellah; D. E. Brooks; M. B. Brown; G. D. Butcher; P. J. Chenoweth; R. M. Clemmons; P. T. Colahan; B. R. Collins; W. S. Cripe; P. W. J. B. Dame; Davenport; G. A. Donovan; G. W. Ellison; R. Francis-Floyd; J. M. Gaskin; P. J. Hansen; B. L. Homer; R. D. Johnson; R. E. Larsen; M. M. LeBlanc; R. J. MacKay; R. E. Raskin; R. L. Reep; S. M. Roberts; D. A. Samuelson; J. K. Shearer; C. A. Sninsky; S. S. Suarez; S. F. Sundlof; J. P. Thompson; T. W. Vickroy; C. E. Wood; T. J. Wronski J. K. Yamamoto. *Assistant Professors:* D. R. Allred; M. M. Christopher; L. E. Fox; R. R. King; D. O. Rae; C. A. Riskoy. *Assistant Scientists:* D. Chakrabarti; M. I. Meltzer. *Instructor:* M. Campbell-Thompson.

The College of Veterinary Medicine offers advanced graduate study leading to the Master of Science and Doctor of Philosophy degrees in veterinary medical sciences. The program provides extensive training in basic and applied research for qualified students with a baccalaureate degree or a D.V.M. or equivalent degree. Applicants are expected to have a background in the biological sciences, mathematics, chemistry, and physics. Particular attention is paid to the advanced education of veterinarians, those interested solely in research and those interested in combining their graduate study with residency training in a clinical specialty. The College offers three major areas of concentration within the veterinary medical sciences program:

Large and Small Animal Clinical Sciences (M.S. only)—physiology, endocrinology, fish diseases, gastroenterology, immunology, laboratory animal comparative medicine, vision sciences, perinatology, reproductive biology, pharmacokinetics, veterinary sports medicine, and wildlife and zoological medicine (C. L. Chen, Graduate Coordinator).

Physiological Sciences—comparative anatomy, physiology, pharmacology, biochemistry, neurobiology, nutrition, reproductive biology, and toxicology (T. J. Wronski, Graduate Coordinator).

Infectious Diseases and Experimental Pathology—bacteriology, parasitology, virology, immunopathology, molecular mechanisms of disease and host defense, epidemiology, and veterinary public health (D. J. Forrester and J. K. Yamamoto, Graduate Coordinators).

The College participates in the interdisciplinary specialization in toxicology in cooperation with other departments and colleges in both the Health Science Center and the Institute of Food and Agricultural Sciences and with the Center for Environmental and Human Toxicology (see the *Toxicology* description under *Interdisciplinary Graduate Studies*).

The following courses in related areas will be acceptable for graduate credit as part of candidates major: **Physiological Sciences**—ANS 6751, DAS 6531, BCH 6206, 6415, 6740, BMS 6510, GMS 5400C, 6735, 7706C, 7743. **Infectious Diseases and Experimental Pathology**—BCH 6415, BMS 5603, GMS 5304C, 5621, 6140, 6152, 6330, 6332, 6333, 6381, 6382. **Large and Small Animal Clinical Sciences**—all of the above.

VME 5162C—Avian Diseases (3) Causes, epizootiology, diagnosis, and methods of prevention and control of avian diseases. Not open to students have taken VME 4162.

VME 5242C—Physiology of Body Fluids (4) *Prereq: PCB 4745C and BCH 4024, or comparable courses.* Physical, endocrine, and neural mechanisms involved in body fluid and cellular homeostasis. Renal and cardiovascular mediation emphasized. Offered in odd-numbered years.

VME 5244—Physiology of Mammals: Organ Systems (4) *Prereq: knowledge of general biochemistry.* Emphasis on domestic animals commonly encountered in veterinary medicine. Physiology of nervous, muscle, blood, cardiovascular, respiratory, renal, gastrointestinal, and endocrine systems.

VME 6135—Diseases of Laboratory Animals I (3) *Prereq: DVM degree and/or permission of instructor.* Microbiological and parasitic diseases of selected rodents, lagomorphs, carnivores, primates, amphibia, reptilia, avians, and miscellaneous species used in research animal modes. Emphasis on etiology, prophylaxis, control, diagnosis, and treatment in research colony situations.

VME 6136—Diseases of Laboratory Animals II (3) *Prereq: DVM degree and/or permission of instructor.* Metabolic, nutritional, neoplastic, genetic, traumatic, reproductive, and other noninfectious diseases of rodents, lagomorphs, carnivores, primates, amphibia, reptilia, avians, and miscellaneous species used as research animal models. Emphasis on etiology, prophylaxis, control, diagnosis, and treatment in research colony situations.

VME 6156—Modern Diagnostic Methods for Infectious Diseases (3) *Prereq: BCH 6740, GMS 6140.* Review and evaluation of new and developing methods for diagnosis of infectious diseases with emphasis on serological and nucleic-acid-based approaches. Theory, development, and applications discussed in context of current literature.

VME 6192—Principles of Scientific Research (3) *Prereq: BMS 5603 or equivalent or consent of instructor.* Introduction to history, logic, and philosophy of scientific problem solving with emphasis on application of theoretical knowledge to understanding disease mechanisms.

VME 6235—Biology and Management of Selected Rodentia, Lagomorpha, Carnivora in Institutional Colonies (2) *Prereq: veterinary medical degree and/or permission of instructor.* Presentation from veterinary medical perspective; emphasis on management of various species in experimental and educational applications.

VME 6236—Biology and Management of Primates, Amphibia, Reptilia, Avians, and Miscellaneous Species in Institutional Colonies (2) *Prereq: veterinary medical degree and/or permission of instructor.* Presentation from veterinary medical perspective; emphasis on management of various species in experimental and educational applications.

VME 6262—Anatomy of Experimental Animals (3) *Prereq: undergraduate courses and/or experience in zoology.* Gross anatomy of mammals used in biomedical research. Comparative anatomy of several commonly used species (dogs, cats, rabbits, rats, and mice) with specific illustration of the anatomical importance of the various species in unique experimental applications.

VME 6326C—Helminthology (4) *Prereq: ZOO 4233C or equivalent.* Morphology, life cycles and physiology of helminths. Emphasis on host-parasite relationships, immune responses, and related research techniques.

VME 6350C—Veterinary Protozoology (4) *Prereq: ZOO 4233C or equivalent.* Life cycles, epidemiology, and diagnosis of parasitic protozoans of food animal, companion animal and exotic animal species, emphasizing the sporozoans.

VME 6464—Molecular Pathogenesis (3; max: 6) *Prereq: biochemistry, immunology, or permission of instructor.* Papers on mechanisms of pathogenesis and molecular approaches toward diagnosis and control of either parasitic or viral and bacterial diseases. Focus alternatives by semester.

VME 6565C—Histological Techniques for Light Microscopy (2) *Prereq: permission of instructor.*

VME 6602—General Toxicology (3) *Prereq: background in biochemistry, physiology, and pharmacology.* General principles of toxicology and mechanisms by which toxic effects occur in target organs and tissues.

VME 6603—Advanced Toxicology (3) *Prereq: VME 6602.* Survey of health effects of each major class of toxicants.

VME 6604—Literature Survey in Toxicology (1) Critical presentation and evaluation of current literature in selected topics in toxicology.

VME 6765—Veterinary Research Techniques (3) Principles of biophysical sciences, and their application to veterinary medical science.

VME 6767—Issues in the Responsible Conduct of Research (1) Presentation and discussion of issues; guiding principles and potential pitfalls.

VME 6776C—Animal Research Methods and Problems (4) *Prereq: PCB 4745C or equivalent. For students aspiring to career in biomedical research.* Basic tenets of anesthesia, surgery, and handling of laboratory animals together with ethics and law involved in animal research.

VME 6905—Problems in Veterinary Medical Sciences (1-4; max: 12) H.
VME 6910—Supervised Research (1-5; max: 5) S/U.
VME 6931—Seminar in Veterinary Medical Sciences (1; max: 8)
VME 6932—Seminar in Physiological Sciences (1; max: 8) Weekly seminar series on topics in comparative physiological sciences, including nervous, cardiovascular, gastrointestinal, urogenital, and musculoskeletal systems.
VME 6933—Seminar in Infectious Diseases and Experimental Pathology (1; max: 8) Weekly seminar series on topics in infectious diseases of animals presented by students, faculty, and visiting speakers.
VME 6934—Topics in Veterinary Medical Sciences (1-4; max: 10) *Prereq: permission of instructor.* Studies in topics involving new developments and/or research techniques in veterinary medical sciences.
VME 6935—Seminar in Veterinary Pathology (1; max: 8) *Prereq: histology.* Weekly seminars on pathology of animals, including bone and joint pathology. Presented by residents, graduate students, faculty, and guest speakers.
VME 6940—Supervised Teaching (1-5; max: 5) S/U.
VME 6971—Research for Master's Thesis (1-15) S/U.
VME 7979—Advanced Research (1-9) Research for doctoral students in veterinary medical sciences before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.
VME 7980—Research for Doctoral Dissertation (1-15) S/U.
WIS 5323C—Impact of Diseases on Wildlife Population (3) *Prereq: WIS 3401 or equivalent.* Diseases of wildlife, with emphasis on their impact on avian and mammalian populations of North America.
BMS 6203—Cell Membranes: Molecular Biology and Function (2) *Prereq: BCH 4203, 4313, and MCB 3020 or equivalent, and consent of instructor.* Composition, molecular organization, and function of biological membranes in both eucaryotes and procaryotes.
GMS 6345—Pathobiology of Cellular Membranes (2) *Prereq: BMS 6203.* Discussion on structural and functional changes of membranes involved in disease states.

WOMEN'S STUDIES
College of Liberal Arts and Sciences

GRADUATE FACULTY 1993-94

Director & Graduate Coordinator: H. Kraft. *Graduate Research Professor:* U. Lele. *Professors:* M. Conway; M. J. Hardman-de-Bautista; E. Langland; M. Margolis; P. Miller; V. Narayanan; M. Nelson; G. Nichols; H. Safa; A. Spring; M. Turim; H. Wass. *Associate Professors:* S. Dickison; D. Hackett; M. Hill-Lubin; A. Jones; L. Lieberman; P. Meek; O. Schutte; C. Shenan. *Assistant Professor:* S. Smith.

The Women's Studies Program is an interdisciplinary forum for the study of gender, its function in cultures and societies, and its intersection with race and class. Feminist and other theoretical approaches and methodologies are employed.

In a regular collquium series, faculty and invited speakers present their research or creative endeavors to the public. Frequently scheduled roundtable and panel discussions allow faculty and students to interact on current issues and new publications in gender and feminist theory. The Program distributes a semiannual newsletter and an occasional update focusing on women's studies. The Women's Studies Program office in 8 Anderson Hall houses archives, a library, an art gallery, offices, and meeting space.

Graduate Certificate Program.—The Graduate Certificate in Women's Studies for master's and docoral students is offered in conjunction with degree programs. Graduate courses in women's studies not listed below are available in the following colleges, programs, or departments: Agriculture Anthropology, Counselor Education, English, German and Slavic Languages and Literatures, History, Instruction and Curriculum, Journalism and Communications, Latin American Studies, Linguistics, Medicine, Nursing, Philosophy, Romance Languages and Literatures, and Sociology. A description of the certificate program may be found in the Special Programs section of this catalog.

For more information, contact the Director, Dr. Helga Draft, 8 Anderson Hall, (904) 392-3365.

WST 5341—Proseminar in Women's Studies (3; max: 6) Introduction to feminist theory, methodology, and application. Emphasis on either humanities or sciences; may be taken once for each emphasis.
WST 6345—Advanced Feminist Theory (3) *Prereq: 6000 level course in feminist theory or equivalent.* Contemporary theory with focus on common themes among academic disciplines.
WST 6346—Feminist Challenges to Traditional Paradigms (3; max: 9) Major feminist thinkers of theoretical movements. Topics include French feminist Luce Irigaray, Marxism and feminist theory, feminism and postmodern theory, African-American feminist theorists, construction of gender identity.
WST 6935—Special Interdisciplinary Topics in Women's Studies (3; max: 6) Selected topic or problem not normally offered in curriculum, including extensive analysis and discussion of contemporary topics. Evaluation of recent literature, research methods, and scholarship of women from multidisciplinary perspective.

ZOOLOGY
College of Liberal Arts and Sciences

GRADUATE FACULTY 1993-94

Chairman: F. G. Nordlie. *Graduate Coordinator:* B. K. McNab. *Katharine Ordway Professor of Ecosystem Conservation:* J. F. Eisenberg. *Arthur R. Marshall, Jr., Professor of Ecological Sciences:* C. S. Holling. *Professors:* B. W. Ache; H. J. Brockmann; L. Brower; W. E. S. Carr; T. C. Emmel; D. H. Evans; C. R. Gilbert; L. J. Guillette, Jr.; J. W. Hardy; S. R. Humphrey; F. C. Johnson, II; J. H. Kaufmann; F. W. King; C. Lanciani; P. O. Lawrence; H. B. Lillywhite; B. J. MacFadden; F. J. Maturo, Jr.; B. K. McNab; F. G. Nordlie; F. G. Thompson; S. D. Webb; C. A. Woods. *Associate Professors:* J. F. Anderson; K. A. Bjorndal; J. T. Giesel; R. Kiltie; D. J. Levey; M. M. Miyamoto; J. Reiskind; M. G. Wheatly; R. G. Wolff. *Assistant Professor:* L. R. McEdward.

The Department of Zoology offers the degrees of Master of Science in Teaching, Master of Science, and Doctor of Philosophy with specialization in animal behavior, ecology, genetics, paleontology, physiology, and systematic biology. Specific areas of specialization include evolutionary biology, marine biology, population biology, and tropical biology.

New graduate students should have completed undergraduate courses in ecology, embryology, comparative anatomy, invertebrate and vertebrate zoology, genetics,

physiology, one year of physics, chemistry through organic, and a sequence in mathematics or statistics. These courses constitute a core curriculum for all candidates for a graduate degree.

EXP 6108—Survey of Sensory Systems (3) *Prereq: PCB 4745C or BMS 6510 or GMS 7760.* A group of specialists provides a survey of theories and experimental data on human and subhuman sensory reception and encoding. Auditory, visual, and the chemical and cutaneous senses are included.

GLY 6660—Paleoecology (3) *Prereq: GLY 4610C or ZOO 3203C.* Paleoautecology, paleosynecology, historical biogeography of marine invertebrates, and ecological rules as applied to fossil invertebrates.

PCB 5307C—Limnology (4) *Prereq: PCB 4044C, CHM 2046.* Biological, chemical, and physical dynamics of inland waters.

PCB 5317C—Marine Ecology (4) *Prereq: ZOO 3203C; CHM 2046 or equivalent.* Marine communities, analytical techniques and the physical, chemical, and biological factors that influence them.

PCB 5415C—Behavioral Ecology (4) *Prereq: ZOO 3303C or PCB 4044C or consent of instructor.* Behavioral adaptations of animals to their natural environment.

PCB 5459—Morphometrics (3) *Prereq: PCB 4044C, 4674, STA 3024, or equivalents.* Quantitative methods of morphological analysis, with applications in ecological, evolutionary, and physiological biology. Multivariate techniques emphasized.

PCB 5615—Evolutionary Genetics (4) *Prereq: PCB 3063, graduate standing, or consent or instructor.* Patterns and processes of change at molecular level in populations, species, and higher taxonomic groups and their systematic implications.

PCB 5726—Reptilian Functional Morphology (3) *Prereq: vertebrate anatomy and animal physiology, or consent of instructor.* Discussion of morphology and physiology of reptiles, including survey of current approaches and concepts of functional adaptation.

PCB 6049—Seminar in Ecology (2; max: 9) *Prereq: permission of instructor.*

PCB 6355—Amazon Ecology (3) *Prereq: basic knowledge of geography and ecology.* Background material and selected research concerning dynamics of the Amazon rain forest. Emphasis on animals and plants and their environmental adaptations.

PCB 6357C—Tropical Biology: An Ecological Approach (8) Field study of ecological concepts in tropical environments. Offered in Costa Rica as part of the program of the Organization for Tropical Studies.

PCB 6377C—Physiological Ecology of Vertebrates (4) *Prereq: course in physiology.* Physiological mechanisms that influence distribution and ecological relations, water conservation, and energy exchange in vertebrates.

PCB 6447C—Community Ecology (4) *Prereq: PCB 4044C or equivalent and permission of the instructor.* The evolutionary ecology of communities; conceptual and quantitative approaches to community structure. Field laboratories in representative communities of the region.

PCB 6496C—Stream Ecology (4) *Prereq: ENY 3005C, PCB 4044C or 3043C, CHM 2046, PHY 3054.* Physical, chemical, and biological interrelationships in flowing fresh water.

PCB 6605C—Principles of Systematic Biology (4) Theory of biological classification and taxonomic practice. Laboratory experience in taxonomic procedures and techniques, including computer methods.

PCB 6686C—Experimental Population Ecology (3) Consideration of empirical tests of hypotheses concerning population dynamics, competition, and predation.

PCB 6796C—Comparative Sensory Physiology (4) *Prereq: PCB 4745C or equivalent and consent of instructor.* Classical concepts and modern research concerning the neurophysiological basis of invertebrate and vertebrate behavior.

PCB 6815—Hormone Regulation of Invertebrate Behavior (3) Survey and analysis of invertebrate behaviors regulated by hormones. Invertebrates considered include arthropods, coelenterates, helminths, and molluscs.

PGY 5246—Biophotography (3) Laboratory, field, and darkroom techniques in 35mm still photography for biological research publications, posters, and slide presentations.

ZOO 5115C—Vertebrate Paleontology (3) *Prereq: ZOO 3703C.* Evolutionary history of major vertebrate groups, with special emphasis on principles of prehistoric investigations.

ZOO 5265C—Crustacean Biology (4) *Prereq: ZOO 3203C or permission of instructor.* Biology of Crustacea including systematics, physiology, and adaptations to the environment, behavior, life history strategies, and community ecology.

ZOO 5276C—Malacology (3) A discussion of the systematics, origin, distribution, and ecology of the Mollusca. The laboratory will emphasize the Southeastern fauna. Lecture will consider the world fauna.

ZOO 5315C—Natural History of the Caribbean Area (4) A consideration of various components of the fauna of the Antilles, evaluating the influences of geological history and climate on their evolutionary histories.

ZOO 5405C—The Physiology of Marine Animals (3) Functioning and interrelationships of marine animals considered from the standpoint of comparative physiology.

ZOO 5458—Fish Physiology (3) *Prereq: functional vertebrate anatomy and animal physiology or consent of instructor.* A consideration of the general and unique functions of organs and organ systems of the fish-like vertebrates.

ZOO 5486C—Mammalogy (4) *Prereq: ZOO 3303C.*

ZOO 5939—Seminar in Morphology (2; max: 9) *Prereq: consent of instructor.* Advanced topics in the description, analysis and evolution of animal form.

ZOO 6117—Vertebrate Paleoecology (3) *Prereq: basic knowledge of ecology and paleontology.* Paleoecological analysis of fossil vertebrate assemblages. Interpretation of fossil data as a basis for paleocommunity and paleoenvironmental studies.

ZOO 6207C—Advanced Invertebrate Zoology (4) *Prereq: ZOO 3203C.* Morphology, physiology, development, and life cycles of selected invertebrate groups, with emphasis on the minor phyla.

ZOO 6416C—Biology of the Amphibia (4) *Prereq: ZOO 3303C.* Evolution, morphology, physiology, and behavior of amphibians.

ZOO 6456C—Ichthyology (4) *Prereq: ZOO 3303C.*

ZOO 6466C—Biology of the Reptilia (4) *Prereq: ZOO 3303C.* Systematics, life cycles, and behavior of reptiles.

ZOO 6477—Birds of World (Lower Orders) (2) Survey of orders and families of non-passerine birds.

ZOO 6478—Birds of World (Passeriformes) (2) Survey of orders and families of passerine birds.

ZOO 6506C—Ethology (4) *Prereq: ZOO 3513C, graduate standing or consent of instructor.* History, concepts, and methods of the comparative study of animal behavior. The evolution, mechanisms, and classification of behavior.

ZOO 6816—Zoogeography (2)

ZOO 6857C—Advanced Tropical Zoology (8) Vertebrate or invertebrate group selected as basis for studies of ecological systems in the tropics. Effects of elevation and temperatures on populations, successions, microhabitat, distribution, predation, evolution, and other aspects. Offered in Costa Rica as part of the program of the Organization for Tropical Studies.

ZOO 6905—Individual Studies (1-8; max: 12)

ZOO 6910—Supervised Research (1-5; max: 5) S/U.

ZOO 6927—Special Topics in Zoology (1-4; max: 15)

ZOO 6939—Seminar in Animal Behavior (1-3; max: 9) *Prereq: PCB 5415C or consent of instructor.* Special behavioral topics.

ZOO 6940—Supervised Teaching (1-5; max: 5) S/U.

ZOO 6943—Internship in College Teaching (2, 4, 6; max: 6) Primarily for Master of Science in Teaching students but available for students needing additional practice and direction in college-level teaching.

ZOO 6971—Research for Master's Thesis (1-15) S/U.

ZOO 7979—Advanced Research (1-9) Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been admitted for a doctoral program. Not open to students who have been admitted to candidacy. S/U.

ZOO 7980—Research for Doctoral Dissertation (1-15) S/U.

GRADUATE FACULTY

(Listing Professorial Rank and First Graduate Appointment)

ABBASCHIAN, REZA, Ph.D. (University of California at Berkeley)
Professor, Materials Science and Engineering

ABBITT, JOHN D., Ph.D. (University of Virginia)
Assistant Professor, Aerospace Engineering, Mechanics, and Engineering Science

ABBOTT, THOMAS B., Ph.D. (University of Florida)
Professor, Communication Processes and Disorders

ABDEL-KHALIK, A. RASHAD, Ph.D. (University of Illinois)
Graduate Research Professor, Accounting

ABRAMS, ROBERT M., Ph.D. (University of Pennsylvania)
Professor, Obstetrics and Gynecology

ACHE, BARRY W., Ph.D. (University of California at Santa Barbara)
Professor, Zoology

ACHEY, PHILLIP M., Ph.D. (Pennsylvania State University)
Professor, Microbiology and Cell Science

ACKERMAN, NORMAN, D.V.M. (Auburn University)
Professor, Veterinary Medicine

ADAIR, JAMES H., Ph.D. (University of Florida)
Associate Professor, Materials Science and Engineering

ADAMS, CHARLES M., Ph.D. (University of Florida)
Associate Professor, Food and Resource Economics

ADAMS, EARNEST D., Ph.D. (Duke University)
Professor, Physics

ADAMS, JAMES D., Ph.D. (University of Chicago)
Professor, Economics

ADAMS, THOMASINA LOTT, Ph.D. (University of Florida)
Assistant Professor, Instruction and Curriculum

ADLER, JEFFREY S., Ph.D. (Harvard University)
Associate Professor, History

AGEE, HERNDON R., Ph.D. (Tufts University)
Professor, Entomology and Nematology

AGEE, OWEN F., M.D. (Louisiana State University)
Professor, Radiology

AGRESTI, ALAN G., Ph.D. (University of Wisconsin)
Professor, Statistics

AGRIOS, GEORGE N., Ph.D. (Iowa State University)
Professor, Plant Pathology

AHMED, ANWER S., Ph.D. (University of Rochester)
Assistant Professor, Accounting

AJINKYA, BIPIN B., Ph.D. (University of Minnesota)
Professor, Accounting

AKERS, RONALD L., Ph.D. (University of Kentucky)
Professor, Sociology

ALBA, JOSEPH W. Ph.D. (Tempie University)
Associate Professor, Marketing

ALBREGTS, EARL E., Ph.D. (Purdue University)
Professor, Soil and Water Science

ALBRIGO, LEO G., Ph.D. (Rutgers State University)
Professor, Horticultural Science

ALDRICH, HENRY C., Ph.D. (University of Texas at Austin)
Professor, Microbiology and Cell Science

ALEXANDER, JOHN F., JR., Ph.D. (University of Florida)
Professor, Urban and Regional Planning

ALEXANDER, LAURENCE B., J.D. (Tulane University)
Assistant Professor, Journalism and Communications

ALEXANDER, RUTH H., Ed.D. (Indiana University)
Distinguished Service Professor, Exercise and Sport Sciences

ALGINA, JAMES J., Ed.D. (University of Massachusetts)
Professor, Foundations of Education

ALI, ARSHAD, Ph.D. (University of Salford)
Professor, Entomology and Nematology

ALICKE, MARK D., Ph.D. (University of North Carolina)
Assistant Professor, Psychology

ALLADI, KIRSHNASWA, Ph.D. (University of California at Los Angeles)
Professor, Mathematics

ALLEN, CHARLES M., JR., Ph.D. (Brandeis University)
Professor, Biochemistry and Molecular Biology

ALLEN, ERIC R., Ph.D. (University of Liverpool)
Professor, Environmental Engineering Sciences

ALLEN, JON C., Ph.D. (University of California at Riverside)
Associate Professor, Entomology and Nematology

ALLEN, LEON, Ph.D. (Cornell University)
Professor, Agronomy

ALLRED, DAVID R., Ph.D. (University of California at Riverside)
Assistant Professor, Veterinary Medicine

ALVA, ASHOK K., Ph.D. (Pennsylvania State University)
Assistant Professor, Soil and Water Science

ALVAREZ, JOSE, Ph.D. (University of Florida)
Professor, Food and Resource Economics

AMATEA, ELLEN S., Ph.D. (Florida State University)
Professor, Counselor Education

AMBROSE, JOHN R., Ph.D. (University of Maryland)
Associate Professor, Materials Science and Engineering

AMMERMAN, CLARENCE B., Ph.D. (University of Illinois)
Professor, Animal Science

ANDERSEN, PETER C., Ph.D. (Oregon State University)
Associate Professor, Horticultural Science

ANDERSON, DAVID L., Ph.D. (University of Wisconsin)
Associate Professor, Agronomy

ANDERSON, GENE C., Ph.D. (University of Wisconsin)
Professor, Nursing

ANDERSON, JOHN F., Ph.D. (University of Florida)
Associate Professor, Zoology

ANDERSON, JOHN M., Ph.D. (University of Virginia)
Assistant Professor, Electrical Engineering

ANDERSON, KEVIN J., Ph.D. (University of Kentucky)
Associate Professor, Veterinary Medicine

ANDERSON, PETER A. V., Ph.D. (University of California at Santa Barbara)
Professor, Physiology

ANDERSON, ROLAND C., Ph.D. (University of Florida)
Professor, Aerospace Engineering, Mechanics, and Engineering Science

ANDERSON, TIMOTHY J., Ph.D. (University of California at Berkeley)
Professor, Chemical Engineering

ANDREW, CHRIS O., Ph.D. (Michigan State University)
Professor, Food and Resource Economics

ANDREW, EDWARD R., Ph.D. (Cambridge University)
Graduate Research Professor, Physics

ANDREWS, SAMUEL D., Ph.D. (University of Connecticut)
Associate Professor, Foundations of Education

ANGARAN, DAVID M., M.S. (University of Wisconsin)
Professor, Pharmacy Practice

ANGHAIE, SAMIM, Ph.D. (Pennsylvania State University)
Professor, Nuclear Engineering Sciences

ANGORN, RICHARD A., J.D. (University of Florida)
Professor, Pharmacy Health Care Administration

ANNABLE, MICHAEL D., Ph.D. (Michigan State University)
Assistant Professor, Environmental Engineering Sciences

ANTON, JOHN P., Ph.D. (Columbia University)
Professor, Classics

ANTONINI, GUSTAVO A., Ph.D. (Columbia University)
Professor, Geography

ANUSAVICE, KENNETH J., Ph.D. (University of Florida)
Professor, Materials Science and Engineering

APP, JAMES, Ph.D. (University of Wisconsin)
Professor, Agricultural Education and Communication

ARAUJO, OSCAR E., Ph.D. (Purdue University)
Professor, Pharmacy Practice

ARBUCKLE, LINDA, M.F.A. (Rhode Island School of Design)
Assistant Professor of Art

ARCHBALD, LOUIS F. Ph.D. (University of Minnesota)
Professor, Veterinary Medicine

ARCHER, JAMES, JR., Ph.D. (Michigan State University)
Professor, Counselor Education

ARCHER, WAYNE R., Ph.D. (Indiana University)
Assistant Professor, Finance, Insurance, and Real Estate

ARIET, MARIO, Ph.D. (University of Florida)
Professor, Industrial and Systems Engineering

ARIS, JOHN P., Ph.D. (Stanford University)
Assistant Professor, Anatomy and Cell Biology

ARMSTRONG, HELENJANE, Ph.D. (Oregon State University)
Professor, Geography

ARNETT, ROSS H., Ph.D. (Cornell University)
Professor, Entomology and Nematology

ARNOLD, CALVIN E., Ph.D. (Michigan State University)
Professor, Horticultural Science

ARNOLD, RICHARD W., Ph.D. (Iowa State University)
Professor, Soil and Water Science

ARNY, NANCY P., Ph.D. (University of Massachusetts)
Associate Professor, Forest Resources and Conservation

ARRINGTON, LARRY R., Ph.D. (Ohio State University)
Professor, Agricultural Education and Communication

ARROYO, AMAURI A., Ph.D. (University of Florida)
Associate Professor, Electrical Engineering

ARVANITIS, LOUKAS G., Ph.D. (University of California at Berkeley)
Professor, Forest Resources and Conservation

ASBURY, ATWOOD C., D.V.M. (Michigan State University)
Professor, Veterinary Medicine

ASH, CAROL REED, Ed.D. (Teachers College of Columiba University)
Kirbo Eminent Scholar, Nursing

ASHTON, PATRICIA T., Ph.D. (University of Georgia)
Professor, Foundations of Education

ASQUITH, RICHARD L., D.V.M. (Michigan State University)
Associate Professor, Animal Science

ATKINSON, MARK A., Ph.D. (University of Florida)
Assistant Professor, Pathology and Laboratory Medicine

AUDIRAC-ZAZUETA, IVONNE, Ph.D. (University of Florida)
Assistant Professor, Urban and Regional Planning

AULT, DONALD D., Ph.D. (University of Chicago)
Professor, English

AUXTER, THOMAS P., Ph.D. (Byrn Mawr College)
Associate Professor, Philosophy

AVELLANEDA, ANDRES O., Ph.D. (University of Illinois)
Professor, Romance Languages and Literatures

AVERY, PAUL R., Ph.D. (University of Illinois)
Associate Professor, Physics

AYOUB, ELIA M., M.D. (American University of Beirut)
Professor, Immunology and Medical Microbiology

BABB, EMERSON M., Ph.D. (Pennsylvania State University)
Ben Hill Griffin, Jr., Professor of Agricultural Marketing

BACHMAN, KERMIT C., Ph.D. (University of Maryland)
Associate Professor, Dairy Science

BACUS, JAMES N., Ph.D. (University of Wisconsin)
Associate Professor, Animal Science

BAGNALL, LARRY O., Ph.D. (Cornell University)
Professor, Agricultural Engineering

BAILEY, LYNN B., Ph.D. (Purdue University)
Professor, Food Science and Human Nutrition

BAILEY, THOMAS L., Ph.D. (University of Chicago)
Professor, Physics

BAIRD, CARL D., Ph.D. (University of Florida)
Professor, Agricultural Engineering

BAKER, EARL W., Ph.D. (Johns Hopkins University)
Professor, Chemistry

BAKER, EDWARD, Ph.D. (Harvard University)
Associate Professor, Romance Languages and Literatures

BAKER, FRANK S., JR., M.S.A. (University of Florida)
Professor, Animal Science

BAKER, HENRY V., Ph.D. (University of Maryland)
Associate Professor, Immunology and Medical Microbiology

BAKER, RICHARD H., Ph.D. (University of Illinois)
Professor, Entomology and Nematology

BAKER, STEPHEN P., Ph.D. (University of Aston, England)
Professor, Pharmacology and Therapeutics

BAKER, SUSAN R., Ph.D. (Harvard University)
Professor, Romance Languages and Literatures

BALABAN, MURAT O., Ph.D. (University of Washington)
Associate Professor, Food Science and Human Nutrition

BALANOFF, NEAL, Ph.D. (Northwestern University)
Professor, Nursing

BALLERINI, ROCCO, Ph.D. (Colorado State University)
Associate Professor, Statistics

BARANOWSKI, RICHARD M., Ph.D. (University of Connecticut)
Professor, Entomology and Nematology

BARBET, ANTHONY F., Ph.D. (Cambridge University)
Associate Professor, Veterinary Medicine

BARFIELD, CARL S., Ph.D. (Texas A&M University)
Professor, Entomology and Nematology

BARGAD, WARREN, Ph.D. (Brandeis University)
Associate Professor, English

BARGER, BENJAMIN, Ph.D. (Duke University)
Professor, Clinical and Health Psychology

BARKSDALE, E. C., Ph.D. (Ohio State University)
Professor, Germanic and Slavic Languages and Literatures

BARLETTA, BARBARA A., Ph.D. (Bryn Mawr College)
Associate Professor, Art

BARNARD, DONALD R., Ph.D. (University of California at Riverside)
Associate Professor, Entomology and Nematology

BARNARD, EDWARD L., Ph.D. (Duke University)
Assistant Professor, Plant Pathology

BARNETT, RONALD D., Ph.D. (Purdue University)
Professor, Agronomy

BARRETT, DOUGLAS J., M.D. (University of South Florida)
Eminent Scholar, Immunology and Medical Microbiology

BARRETT, JAMES E., Ph.D. (Michigan State University)
Professor, Horticultural Science

BARRON, DONALD H., Ph.D. (Yale University)
Professor, Physiology

BARTLETT, RODNEY J., Ph.D. (University of Florida)
Graduate Research Professor, Chemistry

BARTLEY, ERNEST R., Ph.D. (University of California at Berkeley)
Professor, Urban and Regional Planning

BARTZ, JERRY A., Ph.D. (University of Wisconsin)
Associate Professor, Plant Pathology

BASSETT, MARK J., Ph.D. (University of Maryland)
Professor, Horticultural Science

BATES, DOUGLAS B., Ph.D. (Michigan State University)
Associate Professor, Animal Science

BATES, ROBERT P., Ph.D. (Massachusetts Institute of Technology)
Professor, Food Science and Human Nutrition

BATES, STANLEY R., Ph.D. (University of Florida)
Associate Engineer, Materials Science and Engineering

BATICH, CHRISTOPHER D., Ph.D. (Rutgers University)
Professor, Materials Science and Engineering

BATTELLE, BARBARA A., Ph.D. (Syracuse University)
Associate Professor, Neuroscience

BATTISTE, MERLE A., Ph.D. (Columbia University)
Professor, Chemistry

BAUER, RUSSELL M., Ph.D. (Pennsylvania State University)
Associate Professor, Clinical and Health Psychology

BAUGHMAN, RONALD A., D.D.S. (Virginia Commonwealth University)
Professor, Dentistry

BAUM, ROBERT J., Ph.D. (Ohio State University)
Professor, Philosophy

BAUMGARTNER, THOMAS G., Pharm.D. (University of the Pacific)
Associate Professor, Nursing

BAZER, FULLER W., Ph.D. (North Carolina State University)
Graduate Research Professor, Animal Science

BEAR, MARY J., Ph.D. (University of Florida)
Assistant Professor, Nursing

BEATTY, CHARLES L., Ph.D. (University of Massachusetts)
Professor, Materials Science and Engineering

BEAULIEU, LIONEL J., Ph.D. (Purdue University)
Professor, Sociology

BECHTEL, GORDON G., Ph.D. (University of Michigan)
Professor, Marketing

BECK, HOWARD W., Ph.D. (University of Florida)
Assistant Professor, Agricultural Engineering

BECKER, WILLIAM J., Ph.D. (Ohio State University)
Professor, Agricultural Engineering

BECNEL, JAMES J., Ph.D. (University of Florida)
Assistant Professor, Entomology and Nematology

BEDNAREK, ALEXANDER R., Ph.D. (State University of New York at Buffalo)
Professor, Mathematics

BEEDE, DAVID K., Ph.D. (University of Kentucky)
Professor, Dairy Science

BEEGHLEY, LEONARD, II, Ph.D. (University of California at Riverside)
Professor, Sociology

BEEMAN, CARL E., Ed.D. (Cornell University)
Professor, Agricultural Education and Communication

BEHAR, LINDA S., Ph.D. (Loyola University of Chicago)
Assistant Professor, Educational Leadership

BEHNKE, MARYLOU, M.D. (University of Florida)
Associate Professor, Nursing

BEHR, ROBERT M., Ph.D. (University of Florida)
Professor, Food and Resource Economics

BEILOCK, RICHARD P., Ph.D. (Pennsylvania State University)
Professor, Food and Resource Economics

BELAND, ROBERT M., Ph.D. (University of Maryland)
Associate Professor, Recreation, Parks, and Tourism

BELAR, CYNTHIA D., Ph.D. (Ohio University)
Professor, Clinical and Health Psychology

BELARDINELLI, LUIZ, M.D. (Medical Catholic Faculty Foundation)
Eminent Scholar, Physiology

BELK, DAVE M., Ph.D. (Mississippi State University)
Assistant Professor, Aerospace Engineering, Mechanics, and Engineering Science

BELLAH, JAMIE R., D.V.M. (Colorado State University)
Associate Professor, Veterinary Medicine

BENGSTON, JOHN K., Ph.D. (University of Toledo)
Associate Professor, Foundations of Education

BENNETT, GUDRUN, Ph.D. (Rockefeller University)
Scientist, Anatomy and Cell Biology

BENNETT, JERRY M., Ph.D. (University of Nebraska)
Professor, Agronomy

BENSON, HAROLD P., Ph.D. (Northwestern University)
Professor, Decision and Information Sciences

BERARDO, DONNA E., Ph.D. (University of Florida)
Associate Professor, Pharmacy Health Care Administration

BERARDO, FELIX M., Ph.D. (Florida State University)
Professor, Sociology

BERG, SANFORD V., Ph.D. (Yale University)
Professor, Economics

BERG, WILLIAM K., Ph.D. (University of Wisconsin)
Professor, Psychology

BERGER, RICHARD D., Ph.D. (University of Wisconsin)
Professor, Plant Pathology

BERGERON, RAYMOND J., Ph.D. (Brandeis University)
Graduate Research Professor, Medicinal Chemistry

BERMUDEZ, MANUEL E., Ph.D. (University of California at Santa Cruz)
Associate Professor, Computer and Information Sciences

BERNARD, DONALD H., Ed.D. (Columbia University)
Associate Professor, Instruction and Curriculum

BERNARD, H. RUSSELL, Ph.D. (University of Illinois)
Professor, Anthropology

BERTHOLF, ROGER L., Ph.D. (University of Virginia)
Associate Professor, Pathology and Laboratory Medicine

BESCH, EMERSON L., Ph.D. (University of California at Berkeley)
Professor, Animal Science and Veterinary Medicine

BEST, GEORGE R., Ph.D. (University of Georgia)
Scientist, Environmental Engineering Sciences

BEVIS, HERBERT A., Ph.D. (University of Florida)
Professor, Environmental Engineering Sciences

BEWICK, THOMAS A., Ph.D. (University of Wisconsin)
Associate Professor, Horticultural Science

BEYETTE, THOMAS K., Ph.D. (University of Texas at Austin)
Associate Professor, English

BIEBER, THEODORE I., Ph.D. (New York University)
Professor, Chemistry

BIGGS, ROBERT H., Ph.D. (Purdue University)
Professor, Horticultural Science

BIRD, PATRICK J., Ph.D. (University of Minnesota)
Professor, Exercise and Sport Sciences

BIRO, JOHN I., Ph.D. (Syracuse University)
Professor, Philosophy

BITSANIS, IOANNIS A., Ph.D. (University of Minnesota)
Assistant Professor, Chemical Engineering

BITTON, GABRIEL, Ph.D. (Hebrew University)
Professor, Environmental Engineering Sciences

BITZ, DIANA H., Ph.D. (Emory University)
Assistant Professor, Architecture

BJORNDAL, KAREN, Ph.D. (University of Florida)
Associate Professor, Zoology

BLAIR, ROGER D., Ph.D. (Michigan State University)
Professor, Economics

BLAKESLEE, GEORGE M., Ph.D. (Duke University)
Associate Professor, Forest Resources and Conservation

BLAKEY, ARCH F., Ph.D. (Florida State University)
Associate Professor, History

BLANCHARD, FRANK N., Ph.D. (University of Michigan)
Professor, Geology

BLASHFIELD, ROGER K., Ph.D. (Indiana University)
Professor, Clinical and Health Psychology

BLAZQUEZ, CARLOS H., Ph.D. (University of Florida)
Associate Professor, Horticultural Science

BLEIWEIS, ARNOLD S., Ph.D. (Pennsylvania State University)
Graduate Research Professor, Oral Biology

BLOCK, A.J., M.D. (Johns Hopkins University)
Professor, Medicine

BLOCK, LOUIS S., Ph.D. (Northwestern University)
Professor, Mathematics

BLOOMBERG, MARK S., D.V.M. (Purdue University)
Professor, Veterinary Medicine

BLOOMQUIST, DAVID G., Ph.D. (University of Florida)
Assistant Professor, Civil Engineering

BLUE, WILLIAM G., Ph.D. (University of Missouri)
Professor, Soil and Water Science

BLUME, ROBERT A., Ph.D. (University of Michigan)
Professor, Instruction and Curriculum

BOBROFF, LINDA B., Ph.D. (Rutgers State University)
Associate Professor, Food Science and Human Nutrition

BOCK, ELMER W., Ph.D. (Iowa State University)
Professor, Sociology

BODINE, WILLIS R., JR., M.M. (University of Texas at Austin)
Professor, Music

BODOR, NICHOLAS S., Ph.D. (Babes-Bolyai University)
Graduate Research Professor, Pharmaceutics

BOGGESS, WILLIAM G., Ph.D. (Iowa State University)
Professor, Food and Resource Economics

BOGGS, STEPHEN R., Ph.D. (West Virginia University)
Associate Professor, Clinical and Health Psychology

BOLCH, WILLIAM E., JR., Ph.D. (University of California at Berkeley)
Professor, Environmental Engineering Sciences

BOLDEN, BERNADINE J., Ph.D. (University of Florida)
Assistant Professor, Instruction and Curriculum

BOLDUC, ELROY J., JR., Ed.D. (University of Tennessee)
Professor, Instruction and Curriculum

BOLLET, ROBERT M., Ed.D. (Ball State University)
Assistant Professor, Counselor Education

BOLTEN, ALAN B., Ph.D. (University of Florida)
Assistant Scientist, Forest Resources and Conservation

BOLTON, ELIZABETH B., Ph.D. (Florida State University)
Professor, Agricultural Education and Communication

BOMAN, BRIAN J., Ph.D. (Utah State University)
Associate Professor, Agricultural Engineering

BOMBERGER, WILLIAM A., Ph.D. (Brown University)
Associate Professor, Economics

BONACCORSO, FRANK J., Ph.D. (University of Florida)
Assistant Professor, Zoology

BONCELLA, JAMES M., Ph.D. (University of California at Berkeley)
Associate Professor, Chemistry

BONDY, ELIZABETH, Ph.D. (University of Florida)
Assistant Professor, Instruction and Curriculum

BONNEVILLE, DOUGLAS A., Ph.D. (Ohio State University)
Professor, Romance Languages and Literatures

BOOTE, KENNETH J., Ph.D. (Purdue University)
Professor, Agronomy

BOOTH, JAMES G., Ph.D. (University of Kentucky)
Associate Professor, Statistics

BOROVSKY, DOV, Ph.D. (University of Miami)
Professor, Entomology and Nematology

BORST, STEPHEN E., Ph.D. (University of California at Los Angeles)
Assistant Research Scientist, Pharmacology and Therapeutics

BORUM, PEGGY R., Ph.D. (University of Tennessee)
Professor, Food Science and Human Nutrition

BOSMAN, GIJS, Ph.D. (State University of Utrecht)
Professor, Electrical Engineering

BOUCIAS, DRION G., Ph.D. (University of Kentucky)
Professor, Entomology and Nematology

BOVA, FRANK J., Ph.D. (University of Florida)
Associate Professor, Radiology

BOWERS, DAWN, Ph.D. (University of Florida)
Associate Professor, Clinical and Health Psychology

BOWES, GEORGE E., Ph.D. (London University)
Professor, Botany

BOXER, DIANA, Ph.D. (University of Pennsylvania)
Assistant Professor, Linguistics

BOYCE, RICHARD P., Ph.D. (Yale University)
Professor, Biochemistry and Molecular Biology

BOYLES, JESSE V., Ph.D. (University of Florida)
Associate Professor, Accounting

BOYSEN, PHILIP G., M.D. (Loyola College)
Professor, Exercise and Sport Sciences

BRACKBILL, YVONNE, Ph.D. (Stanford University)
Graduate Research Professor, Psychology

BRADDOCK, ROBERT J., Ph.D. (Michigan State University)
Professor, Food Science and Human Nutrition

BRADLEY, MARGARET M., Ph.D. (University of Wisconsin-Madison)
Assistant Scientist, Psychology

BRADY, LINDA J., Ph.D. (University of Florida)
Assistant Scientist, Oral Biology

BRAJTER-TOTH, ANNA F., Ph.D. (Southern Illinois University)
Associate Professor, Chemistry

BRANCH, LYN C., Ph.D. (University of California at Berkeley)
Assistant Professor, Forest Resources and Conservation

BRANCH, MARC N., Ph.D. (University of Maryland)
Professor, Psychology

BRANDMAN, RUSSELLA, Ph.D. (Florida State University)
Associate Professor, Theatre

BRANDT, STEVEN A., Ph.D. (University of California at Berkeley)
Associate Professor, Anthropology

BRANTLEY, RICHARD E., Ph.D. (Princeton University)
Professor, English

BRATEMAN, LIBBY F., Ph.D. (University of Florida)
Associate Professor, Nuclear Engineering Sciences

BRAUN, ROBERT K., D.V.M. (Cornell University)
Professor, Veterinary Medicine

BRAYLAN, RAUL C., M.D. (Buenos Aires University)
Professor, Pathology and Laboratory Medicine

BRAZEAU, GAYLE ANN, Ph.D. (State University of New York at Buffalo)
Assistant Professor, Pharmaceutics

BRECHNER, BEVERLY L., Ph.D. (Louisiana State University)
Professor, Mathematics

BRECHT, JEFFREY K., Ph.D. (University of California at Davis)
Associate Professor, Horticultural Science

BRECHUE, WILLIAM F., Ph.D. (Indiana University)
Assistant Scientist, Pharmacology and Therapeutics

BRECKE, BARRY J., Ph.D. (Cornell University)
Associate Professor, Agronomy

BREDAHL, AXEL C., JR., Ph.D. (University of Pittsburgh)
Professor, English

BRENDEMUHL, JOEL H., Ph.D. (University of Nebraska)
Associate Professor, Animal Science

BRENNAN, ANTHONY B., Ph.D. (Virginia Polytechnic Institute)
Assistant Professor, Materials Science and Engineering

BRENNER, RICHARD J., Ph.D. (Cornell University)
Assistant Professor, Entomology and Nematology

BREWSTER, MARCUS E., Ph.D. (University of Florida)
Assistant Professor, Medicinal Chemistry

BREY, WALLACE S., JR., Ph.D. (University of Pennsylvania)
Professor, Chemistry

BRIGGS, RICHARD W., Ph.D. (University of Arkansas)
Associate Professor, Biochemistry and Molecular Biology

BRIGHAM, EUGENE F., Ph.D. (University of California at Berkeley)
Graduate Research Professor, Finance, Insurance, and Real Estate

BRINKLEY, LINDA L., Ph.D. (University of California at Irvine)
Associate Professor, Oral Biology

BRLANSKY, RONALD H., Ph.D. (University of California at Berkeley)
Associate Professor, Plant Pathology

BROCKMANN, H. J., Ph.D. (University of Wisconsin)
Professor, Zoology

BRODKORB, PIERCE, Ph.D. (University of Michigan)
Professor, Zoology

BROLMANN, JOHN B., Ph.D. (University of Florida)
Associate Professor, Agronomy

BROOKS, DENNIS E., Ph.D. (University of Florida)
Associate Professor, Veterinary Medicine

BROOKS, JAMES K., Ph.D. (Ohio State University)
Professor, Mathematics

BROOKS, KANDACE L., D.M.A. (University of Georgia)
Assistant Professor, Music

BROWER, LINCOLN P., Ph.D. (Yale University)
Professor, Zoology

BROWN, BOB B., Ph.D. (University of Wisconsin)
Professor, Foundations of Education

BROWN, BRISBANE H., Ph.D. (Oklahoma State University)
Professor, Building Construction

BROWN, DAVID T., M.S. (Washington University)
Assistant Professor, Finance, Insurance, and Real Estate

BROWN, DELINDUS R., Ph.D. (Indiana University)
Associate Professor, Communication Processes and Disorders

BROWN, GEORGE E., Ph.D. (University of Minnesota)
Professor, Plant Pathology

BROWN, MARK G., Ph.D. (University of Missouri)
Associate Professor, Food and Resource Economics

BROWN, MARK T., Ph.D. (University of Florida)
Associate Scientist, Urban and Regional Planning

BROWN, MARY B., Ph.D. (University of Alabama)
Associate Professor, Veterinary Medicine

BROWN, MURRAY, D.V.M. (University of Saskatchewan)
Professor, Veterinary Medicine

BROWN, MYRA L., Ph.D. (University of South Carolina)
Assistant Professor, Political Science

BROWN, RANDALL B., Ph.D. (Oregon State University)
Professor, Soil and Water Science

BROWN, ROSS D., JR., Ph.D. (University of Wisconsin)
Associate Professor, Food Science and Human Nutrition

BROWN, THOMAS A., Ph.D. (University of Florida)
Associate Professor, Oral Biology

BROWN, WILLIAM F., Ph.D. (University of Nebraska)
Associate Professor, Animal Science

BROWN, WILLIAM S., JR., Ph.D. (State University of New York at Buffalo)
Professor, Communication Processes and Disorders

BROWNELL, MARY T., Ph. D. (University of Kansas)
Assistant Protessor, Special Education

BROWNING, HAROLD W., Ph.D. (University of California at Riverside)
Associate Professor, Entomology and Nematology

BROYLES, ARTHUR A., Ph.D. (Yale University)
Professor, Physics

BRUCAT, PHILIP J., Ph.D. (Stanford University)
Associate Professor, Chemistry

BRUNT, DENIS, Ed.D (University of Oregon)
Associate Professor, Physical Therapy

BRUSHWOOD, DAVID B., J.D. (University of Kansas)
Professor, Pharmacy Health Care Administration

BRYAN, HERBERT H., Ph.D. (Cornell University)
Professor, Horticultural Science

BRYAN, ROBERT A., Ph.D. (University of Kentucky)
Professor, English

BRYANT, JAMES O., Ph.D. (University of El Salvador)
Associate Engineer, Environmental Engineering Sciences

BRYANT, MARSHA C., Ph.D. (University of Illinois)
Assistant Professor, English

BUCHLER, JEAN R., Ph.D. (University of San Diego)
Professor, Physics and Astronomy

BUCKINGHAM, GARY R., Ph.D. (University of California at Berkeley)
Assistant Professor, Entomology and Nematology

BUCKLIN, RAY A., M.S. (Louisiana State University)
Associate Professor, Agricultural Engineering

BUERGELT, CLAUS-DIET, Ph.D. (Cornell University) and **D.M.V.** (College of Veterinary Medicine, Hannover, West Germany)
Professor, Pathology and Laboratory Medicine and Veterinary Medicine

BUHI, WILLIAM C., Ph.D. (University of Florida)
Associate Professor, Biochemistry and Molecular Biology

BUHR, KENNETH L., Ph.D. (Iowa State University)
Assistant Professor, Agronomy

BULLIVANT, KEITH, Ph.D. (Birmingham University)
Professor, Germanic and Slavic Languages and Literatures

BULLOCK, THOMAS E., Ph.D. (Stanford University)
Professor, Electrical Engineering

BURK, DOROTHEA E. Ph.D. (Brown University)
Professor, Electrical Engineering

BURKE, CHARLES, Ph.D. (University of Missouri)
Associate Professor, Journalism and Communications

BURKHARDT, ROBERT J., Ph.D. (Florida State University)
Associate Professor, Food and Resource Economics

BURNS, ALLAN F., Ph.D. (University of Washington)
Professor, Anthropology

BURNS, AUGUSTUS M., III, Ph.D. (University of North Carolina)
Associate Professor, History

BURNS, JACQUELINE K., Ph.D. (Pennsylvania State University)
Associate Professor, Horticultural Science

BURNS, JAMES F., Ph.D. (Massachusetts Institute of Technology)
Professor, Industrial and Systems Engineering

BURRIDGE, MICHAEL J., Ph.D. (University of California at Davis)
Professor, Veterinary Medicine

BURROWS, COLIN D., Ph.D. (University of Pennsylvania)
Professor, Veterinary Medicine

BUSBY, WALTER A., Ed.D. (Michigan State University)
Associate Professor, Foundations of Education

BUSEY, PHILIP, Ph.D. (University of Arizona)
Associate Professor, Horticultural Science

BUSHNELL, DAVID, Ph.D. (Harvard University)
Professor, History

BUSS, DARYL D., Ph.D. (University of Wisconsin)
Professor, Animal Science and Veterinary Medicine

BUTCHER, GARY D., Ph.D. (Texas A&M University)
Associate Professor, Veterinary Medicine

BUTLER, GLENN A., Ed.D. (Oklahoma State University)
Distinguished Service Professor, Journalism and Communications

BUTLER, JERRY F., Ph.D. (Cornell University)
Professor, Entomology and Nematology

BUTTON, JAMES W., Ph.D. (University of Texas)
Professor, Political Science

BZOCH, KENNETH R., Ph.D. (Northwestern University)
Professor, Communication Processes and Disorders

CADE, JAMES R., M.D. (University of Texas at Austin)
Professor, Physiology

CAILLER, BERNADETTE A., Ph.D. (Cornell University)
Professor, Romance Languages and Literatures

CAIN, BRIAN D., Ph.D. (University of Illinois)
Assistant Professor, Biochemistry and Molecular Biology

CALDERWOOD, MARON B., Ph.D. (University of Florida) and **V.M.D.** (University of Pennsylvania)
Professor, Pathology and Laboratory Medicine and Veterinary Medicine

CALFEE, DENNIS A., LL.M. in Tax. (University of Florida)
Professor, Taxation

CALIN, WILLIAM C., Ph.D. (Yale University)
Graduate Research Professor, Romance Languages and Literatures

CALKINS, CARROL O., Ph.D. (South Dakota State University)
Associate Professor, Entomology and Nematology

CALVERT, DAVID V., Ph.D. (Iowa State University)
Professor, Soil and Water Science

CAMPBELL, DORIS W., Ph.D. (University of Texas)
Associate Professor, Nursing

CAMPBELL, KENNETH L., Ph.D. (Iowa State University)
Professor, Agricultural Engineering

CAMPBELL-THOMPSON, MARTHA L., Ph.D. (University of Florida)
Instructor, Veterinary Medicine

CAMPINS, HUMBERTO, Ph.D. (University of Arizona)
Associate Professor, Astronomy

CAMPTON, DONALD E., Ph.D. (University of California at Davis)
Associate Professor, Forest Resources and Conservation

CANFIELD, DANIEL E., JR., Ph.D. (Iowa State University)
Professor, Forest Resources and Conservation

CANTLIFFE, DANIEL J., Ph.D. (Purdue University)
Professor, Horticultural Science

CAPALDI, ELIZABETH D., Ph.D. (University of Texas)
Professor, Psychology

CAPEHART, BARNEY L., Ph.D. (University of Oklahoma)
Professor, Industrial and Systems Engineering

CAPINERA, JOHN L., Ph.D. (University of Massachusetts)
Professor, Entomology and Nematology

CAPPELLARI, FRANCISCO G., M. Arch. (University of California at Berkeley)
Associate Professor, Architecture

CARDEILHAC, PAUL T., Ph.D. (University of Pennsylvania)
Professor, Veterinary Medicine

CARLISLE, VICTOR W., Ph.D. (University of Florida)
Professor, Soil and Water Science

CARLOS, JOHN, JR., Ph.D. (Florida State University)
Assistant Professor, Physical Therapy

CARLSON, DAVID A., Ph.D. (University of Hawaii)
Associate Professor, Entomology and Nematology

CARNELL, CORBIN S., Ph.D. (University of Florida)
Professor, English

CARPENTER, JAMES W., Ph.D. (University of Florida)
Professor, Animal Science

CARPENTER, RONALD H., Ph.D. (University of Wisconsin)
Professor, English

CARPENTER, WILLIAM J., Ph.D. (Michigan State University)
Professor, Horticultural Science

CARR, GLENNA D., Ed.D. (University of Florida)
Professor, Instruction and Curriculum

CARR, MARGARET H., M.L.A. (North Carolina State University)
Assistant Professor, Landscape Architecture

CARR, THOMAS D., Ph.D. (University of Florida)
Professor, Physics

CARR, WILLIAM E. S., Ph.D. (Duke University)
Professor, Zoology

CARRIKER, ROY R., Ph.D. (Virginia Polytechnic Institute)
Professor, Food and Resource Economics

CARROLL, BRUCE F., Ph.D. (University of Illinois)
Assistant Professor, Aerospace Engineering, Mechanics, and Engineering Science

CARROLL, DENNIS P., Ph.D. (University of Wisconsin)
Professor, Electrical Engineering

CARROLL, EDWARD E., JR., Ph.D. (University of Pennsylvania)
Professor, Nuclear Engineering Sciences

CARTER, RANDOLPH L., Ph.D. (Iowa State University)
Professor, Statistics

CARTER, TRAVIS A., Ed.D. (University of Florida)
Assistant Professor, Counselor Education

CASAGRANDE, JEAN, Ph.D. (Indiana University)
Professor, Linguistics

CASSIN, SIDNEY, Ph.D. (University of Texas at Austin)
Professor, Physiology

CASSISI, NICHOLAS J., M.D. (University of Miami)
Professor, Communication Processes and Disorders

CASTEEL, JAMES D., Ph.D. (George Peabody College)
Professor, Instruction and Curriculum

CASTLE, WILLIAM S., Ph.D. (University of Florida)
Professor, Horticultural Science

CASTLEMAN, WILLIAM L., Ph.D. (University of California at Davis)
Professor, Veterinary Medicine

CATO, BERTHA, Re.D. (Indiana University at Bloomington)
Associate Professor, Recreation, Parks, and Tourism

CATO, JAMES C., Ph.D. (University of Florida)
Professor, Food and Resource Economics

CATON, DONALD, M.D. (Columbia University)
Professor, Obstetrics and Gynecology

CATTERALL, JOHN E., M.F.A. (Washington State University)
Professor, Art

CAURAUGH, JAMES H., Ph.D. (Florida State University)
Associate Professor, Exercise and Sport Sciences

CAVIEDES, CESAR N., D.Sc. (University of Freiburg)
Professor, Geography

CECH, JOHN, Ph.D. (University of Connecticut)
Associate Professor, English

CENZER, DOUGLAS A., Ph.D. (University of Michigan)
Professor, Mathematics

CERDA, JAMES J., M.D. (University of Maryland)
Professor, Medicine

CHADIK, PAUL A., Ph.D. (University of Arizona)
Assistant Professor, Environmental Engineering Sciences

CHAFIN, MOSES, M.P.H. (University of Florida)
Associate Professor, Recreation, Parks, and Tourism

CHAKRABARTI, DEBOPAM, Ph.D. (University of Calcutta)
Assistant Professor, Veterinary Medicine

CHAKRAVARTHY, UPENDRANATHA S., Ph.D. (University of Maryland)
Associate Professor, Computer and Information Sciences

CHALMERS, DAVID M., Ph.D. (University of Rochester)
Distinguished Service Professor, History

CHAMBERLIN, WILLIAM F., Ph.D. (University of Washington)
Joseph L. Brechner Eminent Scholar in Freedom of Information

CHAMBLISS, CARROL G., Ph.D. (University of Illinois)
Associate Professor, Agronomy

CHAMPION, JOHN M., Ph.D. (Purdue University)
Professor, Health Services Administration

CHANDLER, CRAIG K., Ph.D. (University of Maryland)
Associate Professor, Horticultural Science

CHANG, MYRON N., Ph.D. (University of Maryland)
Associate Professor, Statistics

CHANG, WEILIN P., Ph.D. (State University of New York at Buffalo)
Professor, Building Construction

CHANNELL, JAMES E., Ph.D. (University of Newcastle)
Associate Professor, Geology

CHARUDATTAN, RAGHAVAN, Ph.D. (University of Madras)
Professor, Plant Pathology

CHASE, ANN R., Ph.D. (University of California at Riverside)
Professor, Plant Pathology

CHASE, CHADWICK C., JR., Ph.D. (Texas A&M University)
Assistant Professor, Animal Science

CHASE, CHRISTINE D., Ph.D. (University of Virginia)
Associate Professor, Horticultural Science

CHAU, KHE V., Ph.D. (University of California at Berkeley)
Professor, Agricultural Engineering

CHEEK, JIMMY G., Ph.D. (Texas A&M University)
Professor, Agricultural Education and Communication

CHELLEMI, DANIEL O., Ph.D. (University of California at Davis)
Assistant Professor, Plant Pathology

CHEN, CHAO-LING D., Ph.D. (Michigan State University)
Professor, Veterinary Medicine

CHEN, CHIN-SHU, Ph.D. (North Carolina State University)
Professor, Food Science and Human Nutrition

CHEN, KWAN, Ph.D. (University of Pennsylvania)
Professor, Physics and Astronomy

CHEN, WEI W., Ph.D. (University of Maryland)
Associate Professor, Health Science Education

CHEN, YUNMEI, Ph.D. (Fudan University)
Associate Professor, Mathematics

CHENETTE, EUGENE R., Ph.D. (University of Minnesota)
Professor, Electrical Engineering

CHENG, LEONARD K., Ph.D. (University of California at Berkeley)
Associate Professor, Economics

CHENOWETH, PETER J., Ph.D. (University of Queensland)
Associate Professor, Veterinary Medicine

CHERRY, RONALD H., Ph.D. (University of Illinois)
Associate Professor, Entomology and Nematology

CHEW, VICTOR, B.A. (University of Melbourne)
Associate Professor, Statistics

CHILDERS, CARL C., Ph.D. (University of Missouri)
Professor, Entomology and Nematology

CHILDERS, DONALD G., Ph.D. (University of Southern California)
Professor, Electrical Engineering

CHILDERS, NORMAN F., Ph.D. (Cornell University)
Professor, Horticultural Science

CHOATE, RUSH E., M.S.A. (University of Florida)
Professor, Agricultural Engineering

CHOBAZ, RAYMOND A., Ph.D. (University of Utah)
Associate Professor, Music

CHOMOWICZ, PETER, M.Des. (Harvard University)
Assistant Professor, Architecture

CHOUREY, PREM S., Ph.D. (Indiana University)
Associate Professor, Agronomy

CHOW, YUAN-CHIEH, Ph.D. (University of Massachusetts)
Professor, Computer and Information Sciences

CHRISMAN, CHERYL L., D.V.M. (Michigan State University)
Professor, Veterinary Medicine

CHRISTENSEN, BENT A., Ph.D. (University of Minnesota)
Professor, Civil Engineering

CHRISTIANSEN, KENNETH A., Ed.D. (University of Missouri)
Professor, Journalism and Communications

CHRISTOPHER, MARY M., Ph.D. (University of Minnesota)
Assistant Professor, Veterinary Medicine

CHU, CHAUNCEY C., Ph.D. (University of Texas at Austin)
Professor, Linguistics

CHUN, PAUL W., Ph.D. (University of Missouri)
Professor, Biochemistry and Molecular Biology

CHYNOWETH, DAVID P., Ph.D. (University of North Carolina, Chapel Hill)
Professor, Agricultural Engineering

CICHRA, CHARLES E., Ph.D. (Texas A&M University)
Associate Professor, Forest Resources and Conservation

CIESIELSKI, PAUL F., Ph.D. (Florida State University)
Associate Professor, Geology

CLARK, ANTHONY J., Ph.D. (University of Denver)
Associate Professor, Communication Processes and Disorders

CLARK, ARTHUR E., JR., D.M.D. (University of Florida)
Professor, Materials Science and Engineering

CLARK, DAVID E., Ph.D. (University of Florida)
Professor, Materials Science and Engineering

CLARK, GARY A., Ph.D. (Texas A&M University)
Associate Professor, Agricultural Engineering

CLARK, IRA G., III, Ph.D. (Northwestern University)
Professor, English

CLARK, PHILLIP A., Ed.D. (Western Michigan University)
Professor, Educational Leadership

CLARK, WILLIAM B., D.D.S. (Emory University)
Professor, Oral Biology

CLARKE, DERREL W., M.D. (University of Oregon)
Assistant Professor, Physiology

CLARKSON, MARK H., Ph.D. (University of Texas at Austin)
Professor, Aerospace Engineering, Mechanics, and Engineering Science

CLEMMONS, ROGER M., Ph.D. (Washington State University)
Associate Professor, Veterinary Medicine

CLENDENIN, MARTHA A., Ph.D. (Medical College of Virginia)
Professor, Physical Therapy

CLINE, KENNETH C., Ph.D. (University of Colorado)
Associate Professor, Horticultural Science

CLINE, REBECCA J., Ph.D. (Pennsylvania State University)
Associate Professor, Communication Processes and Disorders

CLOUSER, RODNEY L., Ph.D. (Purdue University)
Professor, Food and Resource Economics

CLUBOK, ALFRED B., Ph.D. (University of Michigan)
Professor, Political Science

CLUGSTON, JAMES P., Ph.D. (University of Georgia)
Professor, Forest Resources and Conservation

COBLE, RICHARD J., Ph.D. (University of Florida)
Associate Professor, Building Construction

COCKBURN, ANDREW F., Ph.D. (University of California at San Diego)
Assistant Professor, Entomology and Nematology

COHEN, EDWIN, Ph.D. (University of Iowa)
Associate Professor, Clinical and Health Psychology

COHEN, HOWARD L., Ph.D. (Indiana University)
Associate Professor, Astronomy

COHEN, JOEL B., Ph.D. (University of California at Los Angeles)
Distinguished Service Professor, Marketing

COHEN, ROBERT J., Ph.D. (Yale University)
Associate Professor, Biochemistry and Molecular Biology

COHEN, RONALD, Ph.D. (University of Wisconsin at Madison)
Professor, Anthropology

COLAHAN, PATRICK T., D.V.M. (University of California at Davis)
Associate Professor, Veterinary Medicine

COLAIZZI, FRANK A., D.D.S. (University of Pittsburgh)
Associate Professor, Dentistry

COLBURN, DAVID R., Ph.D. (University of North Carolina)
Professor, History

COLDWELL, ROBERT L., Ph.D. (University of Washington)
Associate Scientist, Physics

COLE, MAURICE F., Ed.D. (North Carolina State University)
Professor, Agricultural Education and Communication

COLEMAN, SYLVIA E., Ph.D. (University of Florida)
Assistant Professor, Microbiology and Cell Science

COLGATE, SAMUEL O., Ph.D. (Massachusetts Institute of Technology)
Associate Professor, Chemistry

COLLINS, BOBBY, D.V.M. (University of Georgia)
Associate Professor, Veterinary Medicine

COLLINS, MARY E., Ph.D. (Iowa State University)
Associate Professor, Soil and Water Science

COLVIN, DANIEL L., Ph.D. (University of Florida)
Associate Professor, Agronomy

COMAS, JACQUELINE C., Ph.D. (Indiana University)
Assistant Professor, Instruction and Curriculum

COMBS, GEORGE E., JR., Ph.D. (Iowa State University)
Professor, Animal Science

COMER, DOROTHY A., Ph.D. (University of Nebraska)
Associate Professor, Food and Resource Economics

COMERFORD, NICHOLAS B., Ph.D. (State University of New York)
Professor, Soil and Water Science

CONDIT, RICHARD C., Ph.D. (Yale University)
Professor, Immunology and Medical Microbiology

CONLON, MICHAEL, Ph.D. (University of Florida)
Research Associate Professor, Statistics

CONNELL, RICHARD G., JR., Ph.D. (University of Florida)
Associate Professor, Materials Science and Engineering

CONNOR, LARRY J., Ph.D. (Oklahoma State University)
Professor, Food and Resource Economics

CONOVER, CHARLES A., Ph.D. (University of Georgia)
Professor, Horticultural Science

CONRAD, JOSEPH H., Ph.D. (Purdue University)
Professor, Animal Science

CONRADT, DAVID, Ph.D. (Brown University)
Professor, Political Science

CONROY, STEPHEN S., Ph.D. (University of Iowa)
Associate Professor, History

CONSTANT, CAROLINE B., M.Arch. (Princeton University)
Associate Professor, Architecture

CONVERTINO, VICTOR A., Ph.D. (University of California at Davis)
Associate Professor, Exercise and Sport Sciences

CONWAY, M. MARGARET, Ph.D. (Indiana University)
Professor, Political Science

COOK, RONALD, A., Ph.D. (University of Texas at Austin)
Assistant Professor, Civil Engineering

COOPER, BARBARA, Ph.D. (Boston University)
Assistant Professor, History

COOPER, BRIAN Y., Ph.D. (University of Iowa)
Assistant Professor, Neuroscience

COPELAND, EDWARD M., III, M.D. (Cornell University)
Professor, Physiology

CORNELL, JOHN A., Ph.D. (Virginia Polytechnic Institute)
Professor, Statistics

CORREA, VIVIAN I., Ph.D. (Vanderbilt University)
Professor, Special Education

CORRICK, GEORGE W., Ed.D. (University of Florida)
Associate Professor, Educational Leadership

COSTELLO, DONNA M., Ph.D. (University of Rochester)
Assistant Professor, Economics

COTTOM, DANIEL A., Ph.D. (State University of New York at Buffalo)
Professor, English

COUCH, LEON W., II, Ph.D. (University of Florida)
Professor, Electrical Engineering

COURAGE, KEN G., M.S.C.E. (Texas A&M University)
Professor, Civil Engineering

COURAGE, MYRNA M., M.Nsg. (University of Florida)
Assistant Professor, Nursing

COURTNEY, CHARLES H., III, Ph.D. (Ohio State University)
Professor, Veterinary Medicine

COURTWRIGHT, DAVID T., Ph.D. (Rice University)
Professor, History

COUSINS, ROBERT J., Ph.D. (University of Connecticut)
Boston Family Professor of Human Nutrition

COX, RODNEY E., Ph.D. (Iowa State University)
Professor, Building Construction

CRADDOCK, PATRICIA B., Ph.D. (Yale University)
Professor, English

CRAIG, STEPHEN C., Ph.D. (Northwestern University)
Associate Professor, Political Science

CRANDALL, CATHERINE A., Ph.D. (Purdue University)
Professor, Pathology and Laboratory Medicine

CRANDALL, LEE A., Ph.D. (Purdue University)
Professor, Sociology

CRANDALL, RICHARD B., Ph.D. (Purdue University)
Professor, Immunology and Medical Microbiology

CRANE, CARL D. III, Ph.D. (University of Florida)
Associate Professor, Mechanical Engineering

CRANE, JONATHAN HENRY, Ph.D. (University of Florida)
Assistant Professor, Horticultural Science

CRARY, MICHAEL A., Ph.D. (Ohio University)
Professor, Communication Processes and Disorders

CRAVEN, ROY C., JR., M.F.A. (University of Florida)
Professor, Art

CREEL, AUSTIN B., Ph.D. (Yale University)
Professor, Religion

CREW, RICHARD M., Ph.D. (Princeton University)
Associate Professor, Mathematics

CREWS, FULTON T., Ph.D. (University of Michigan)
Professor, Pharmacology and Therapeutics

CRISALLE, OSCAR D., Ph.D. (University of California at Santa Barbara)
Assistant Professor, Chemical Engineering

CRISMAN, THOMAS L., Ph.D. (Indiana University)
Professor, Environmental Engineering Sciences

CRISTESCU, NICOLAE, D.M.P. (University of Bucharest)
Graduate Research Professor, Aerospace Engineering, Mechanics, and Engineering Science

CROCKER, LINDA M., Ph.D. (Michigan State University)
Professor, Foundations of Education

CROCKER, TIMOTHY E., Ph.D. (Michigan State University)
Professor, Horticultural Science

CROKER, BYRON P., JR., Ph.D. (Duke University)
Professor, Pathology and Laboratory Medicine

CROMROY, HARVEY L., Ph.D. (North Carolina State University)
Professor, Entomology and Nematology

CROOK, LARRY N., Ph.D. (University of Texas at Austin)
Assistant Professor, Music

CROOKS, JAMES B., Ph.D. (Johns Hopkins University)
Professor, History

CROPPER, WENDELL P., Ph.D. (Emory University)
Associate Scientist, Forest Resources and Conservation

CROSLAND, ROBERT E., M.A.Arch. (University of Florida)
Professor, Building Construction

CROSSON, BRUCE A., Ph.D. (Texas Technical University)
Associate Professor, Clinical and Health Psychology

CROTTS, JOHN C., Ph.D. (University of Oregon)
Assistant Professor, Recreation, Parks, and Tourism

CRUM, ROY L., Ph.D. (University of Texas at Austin)
Professor, Finance, Insurance, and Real Estate

CSITZINSZKY, ALEXANDER A., Ph.D. (Washington State University)
Associate Professor, Horticultural Science

CUMMING, ANDREW W., Ph.D. (Massachusetts Institute of Technology)
Assistant Professor, Physics

CUNNINGHAM, WALTER R., Ph.D. (University of Southern California)
Professor, Psychology

CURRIER, BARRY A., J.D. (University of Southern California)
Professor, Taxation

CURTIS, CLAYTON C., Ph.D. (Indiana University)
Associate Professor, Finance, Insurance, and Real Estate

CURTRIGHT, THOMAS L., Ph.D. (California Institute of Technology)
Associate Professor, Physics

CUTHBERT, BRUCE N., Ph.D. (University of Wisconsin)
Assistant Scientist, Clinical and Health Psychology

CUTLER, JERRY L., M.F.A. (Ohio State University)
Associate Professor, Art

CUTLER, WILLIAM H., Ph.D. (University of Southern California)
Assistant Professor, Communication Processes and Disorders

DALTON, GEORGE R., Ph.D. (University of Michigan)
Professor, Nuclear Engineering Sciences

DAME, JOHN B., Ph.D. (University of Washington)
Associate Professor, Veterinary Medicine

DAMICO, ALFONSO J., Ph.D. (Ohio State University)
Associate Professor, Political Science

D'AMICO, ROBERT, Ph.D. (State University of New York at Buffalo)
Associate Professor, Philosophy

DAMICO, SANDRA B., Ph.D. (University of Florida)
Professor, Foundations of Education

DAMRON, BOBBY L., Ph.D. (University of Florida)
Professor, Poultry Science

DANKEL, DOUGLAS D., II, Ph.D. (University of Illinois)
Assistant Professor, Computer and Information Sciences

DARNELL, REBECCA L., Ph.D. (University of California at Davis)
Associate Professor, Horticultural Science

DASTA, ANTHONY J., M.S. (University of Illinois)
Professor, Architecture

DATNOFF, LAWRENCE E., Ph.D. (University of Illinois)
Associate Professor, Plant Pathology

DAVENPORT, PAUL W., Ph.D. (University of Kentucky)
Associate Professor, Veterinary Medicine

DAVENPORT, THOMAS L., Ph.D. (Texas A&M University)
Associate Professor, Horticultural Science

DAVIDSON, JAMES M., Ph.D. (University of California at Davis)
Professor, Soil and Water Science

DAVIDSON, JOHN L., Ph.D. (Purdue University)
Professor, Civil Engineering

DAVIDSON, NITA, Ph.D. (University of Alabama)
Professor, Nursing

DAVIES, FREDERICK S., Ph.D. (Cornell University)
Professor, Horticultural Science

DAVIS, CARLTON G., Ph.D. (Michigan State University)
Distinguished Service Professor, Food and Resource Economics

DAVIS, FRANCIS C., JR., Ph.D. (University of Tennessee)
Associate Professor, Microbiology and Cell Science

DAVIS, HUGH C., JR., Ph.D. (University of Tennessee)
Professor, Clinical and Health Psychology

DAVIS, JERRY K., Ph.D. (University of Alabama)
Professor, Pathology and Laboratory Medicine

DAVIS, JOHN M., Ed.D. (Michigan State University)
Assistant Professor, Forest Resources and Conservation

DAVIS, JOSEPH S., Ph.D. (State University of Iowa)
Professor, Botany

DAVIS, JOY H., Ed.D. (University of Florida)
Associate Professor, Nursing

DAVIS, JOYCE F., D.M.A. (Ohio State University)
Assistant Professor, Music

DAVIS, MICHAEL J., Ph.D. (University of California at Berkeley)
Professor, Plant Pathology

DAVIS, RICHARD H., JR., Ph.D. (University of Wisconsin)
Professor, History

DAVIS, TIMOTHY A., Ph.D. (University of Illinois)
Assistant Professor, Computer and Information Sciences

DAWSON, RALPH, Ph.D. (Johns Hopkins University)
Associate Professor, Pharmacodynamics

DAWSON, WILLIAM O., Ph.D. (University of Georgia)
Eminent Scholar, Plant Pathology

DAWSON, WILLIAM W., Ph.D. (Florida State University)
Professor, Neuroscience

DEAGAN, KATHLEEN A., Ph.D. (University of Florida)
Professor, Anthropology

DEAKIN, MOTLEY F., Ph.D. (University of California at Berkeley)
Professor, English

DEAN, ROBERT G., Sc.D. (Massachusetts Institute of Technology)
Graduate Research Professor, Coastal and Oceanographic Engineering

DEERE, DON U., Ph.D. (University of Illinois)
Professor, Geology

DEGNER, ROBERT L., Ph.D. (Texas A&M University)
Professor, Food and Resource Economics

DEHART, PAULA R., Ph.D. (University of Wisconsin)
Assistant Professor, Instruction and Curriculum

DEHGAN, BIJAN, Ph.D. (University of California at Davis)
Professor, Horticultural Science

DEHOFF, ROBERT T., Ph.D. (Carnegie Mellon University)
Professor, Materials Science and Engineering

DELFINO, JOSEPH J., Ph.D. (University of Wisconsin at Madison)
Professor, Environmental Engineering Sciences

DELORENZO, MICHAEL A., Ph.D. (Cornell University)
Associate Professor, Dairy Science

DENSLOW, DAVID A., JR., Ph.D. (Yale University)
Distinguished Service Professor, Economics

DENSLOW, NANCY D., Ph.D. (University of Florida)
Assistant Scientist, Biochemistry and Molecular Biology

DEREN, CHRISTOPHER W., Ph.D. (University of Florida)
Associate Professor, Agronomy

DERENDORF, HARTMUT C., Ph.D. (University of Munster)
Professor, Pharmaceutics

DER-HOUSSIKIAN, HAIG, Ph.D. (University of Texas at Austin)
Professor, Linguistics

DERMOTT, STANLEY F., Ph.D. (University of London)
Professor, Astronomy

DERRICK, KENNETH S., Ph.D. (Texas A&M University)
Professor, Plant Pathology

DESAI, ANAND S., Ph.D. (University of Michigan)
Assistant Professor, Finance, Insurance, and Real Estate

DETWEILER, JOHN S., Ed.D. (University of Florida)
Professor, Journalism and Communications

DETWEILER, STEVEN L., Ph.D. (University of Chicago)
Professor, Physics

DEVANE, CARL L., Pharm. D. (Mercer University)
Professor, Pharmacy Practice

DEWAR, MICHAEL J., Ph.D. (Oxford University)
Graduate Research Professor, Chemistry

DEWITT, BON A., Ph.D. (University of Wisconsin)
Assistant Professor, Civil Engineering

DEWSBURY, DONALD A., Ph.D. (University of Michigan)
Professor, Psychology

DEYRUP, JAMES A., Ph.D. (University of Illinois)
Professor, Chemistry

DIAZ, NILS J., Ph.D. (University of Florida)
Professor, Nuclear Engineering Sciences

DICKISON, SHEILA K., Ph.D. (Bryn Mawr College)
Associate Professor, Classics

DICKSON, DONALD W., Ph.D. (North Carolina State University)
Professor, Entomology and Nematology

DIFINO, SHARON M., Ph.D. (University of Massachusetts)
Assistant Professor, Germanic and Slavic Languages and Literatures

DIFIORE, LINDA L., D.M.A. (University of Minnesota)
Associate Professor, Music

DILCHER, DAVID L., Ph.D. (Yale University)
Graduate Research Professor, Botany

DILLER, GEORGE T., Ph.D. (Stanford University)
Professor, Romance Languages and Literatures

DINCULEANU, NICOLAE, Ph.D. (University of Bucharest)
Professor, Mathematics

DINOPOULOS, ELIAS, Ph.D. (Columbia University)
Professor, Economics

DODD, C. KENNETH, Ph.D. (Clemson University)
Associate Professor, Forest Resources and Conservation

DODD, JULIE E., Ed.D. (University of Kentucky)
Associate Professor, Journalism and Communications

DODD, STEPHEN L., Ph.D. (Louisiana State University)
Associate Professor, Exercise and Sport Sciences

DODDINGTON, HAROLD W., Ph.D. (University of Florida)
Engineer, Aerospace Engineering, Mechanics, and Engineering Science

DOERING, PAUL L., M.S.P. (University of Florida)
Professor, Pharmacy Practice

DOLBIER, WILLIAM R., JR., Ph.D. (Cornell University)
Professor, Chemistry

DOLWICK, M. FRANKLIN, Ph.D. (Virginia Commonwealth University)
Professor, Oral Biology

DOMIJAN, ALEXANDER, Ph.D. (University of Texas)
Associate Professor, Electrical Engineering

DOMINIAK, KENNETH E., Ph.D. (Polytechnic Institute of Brooklyn)
Associate Professor, Industrial and Systems Engineering

DONELIN, DANIEL W., M.L.Arch. (Michigan State University)
Professor, Landscape Architecture

DONNELLY, WILLIAM H., JR., M.D. (University of Ottawa)
Professor, Pathology and Laboratory Medicine

DONOVAN, GERALD A., D.V.M. (Ontario Veterinary College)
Associate Professor, Veterinary Medicine

DORMAN, PHYLLIS E., Ed.D. (State University of New York)
Professor, Music

DORMAN, STEVEN M., Ph.D. (University of Tennessee)
Associate Professor, Health Science Education

DOTY, KEITH L., Ph.D. (University of California at Berkeley)
Professor, Electrical Engineering

DOUGHERTY, MOLLY C., Ph.D. (University of Florida)
Professor, Nursing

DOUGHTY, PAUL L., Ph.D. (Cornell University)
Distinguished Service Professor, Anthropology

DOW, JOSE K., Ph.D. (University of Missouri)
Professor, Food and Resource Economics

DRAGO, RUSSELL S., Ph.D. (Ohio State University)
Graduate Research Professor, Chemistry

DRAKE, DAVID A., Ph.D. (Syracuse University)
Professor, Mathematics

DRISCOLL, DANIEL J., Ph.D. (Indiana University)
Assistant Professor, Immunology and Medical Microbiology

DROST, MAARTEN, D.V.M. (Iowa State University)
Professor, Veterinary Medicine

DRUCKER, DANIEL C., Ph.D. (Columbia University)
Graduate Research Professor, Aerospace Engineering, Mechanics, and Engineering Science

DRUMMOND, H. EVAN, Ph.D. (Purdue University)
Professor, Food and Resource Economics

DRUMMOND, ROBERT J., Ed.D. (Columbia University)
Professor, Counselor Education

DRUMMOND, R. WAYNE, M.A.Arch. (Rice University)
Professor, Architecture

DRUMMOND, WILLA H., M.D. (University of Pennsylvania)
Professor, Physiology

DRUMMOND, WILLIAM H., Ed.D. (Stanford University)
Professor, Educational Leadership

DUCKWORTH, ALISTAIR M., Ph.D. (Johns Hopkins University)
Professor, English

DUCKWORTH, DONNA H., Ph.D. (Johns Hopkins University)
Professor, Immunology and Medical Microbiology

DUDECK, ALBERT E., Ph.D. (Pennsylvania State University)
Professor, Horticultural Science

DUDLEY, GARY A., Ph.D. (Ohio State University)
Professor, Exercise and Sport Sciences

DUFF, WILLIAM P., M.D. (Georgetown University)
Professor, Oral Biology

DUFFY, JOSEPH, Ph.D. (University of Liverpool)
Graduate Research Professor, Mechanical Engineering

DUFTY, JAMES W., Ph.D. (Lehigh University)
Professor, Physics

DUGAN, EDWARD T., Ph.D. (University of Florida)
Associate Professor, Nuclear Engineering Sciences

DUGGAN, DENNIS E., Ph.D. (Oregon State University)
Associate Professor, Microbiology and Cell Science

DUNAVIN, LEONARD S., Ph.D. (University of Florida)
Associate Professor, Agronomy

DUNCAN, LARRY W., Ph.D. (University of California at Riverside)
Associate Professor, Entomology and Nematology

DUNCAN, R.P., Ph.D. (Purdue University)
Professor, Health Services Administration

DUNKLE, JOHN R., Ph.D. (Clark University)
Professor, Geography

DUNN, BEN M., Ph.D. (University of California at Santa Barbara)
Professor, Biochemistry and Molecular Biology

DUNN, ROBERT A., Ph.D. (Cornell University)
Professor, Entomology and Nematology

DUNN, WILLIAM A., Ph.D. (Pennsylvania State University)
Assistant Professor, Anatomy and Cell Biology

DUNNAM, FRANCIS E., Ph.D. (Louisiana State University)
Professor, Physics

DURAN, RANDOLPH, Ph.D. (University Louis Pasteur)
Assistant Professor, Chemistry

DURYEA, MARY L., Ph.D. (Oregon State University)
Associate Professor, Forest Resources and Conservation

DUSKY, JOAN A., Ph.D. (North Dakota State University)
Associate Professor, Horticultural Science

DUTOIT, BRIAN M., Ph.D. (University of Oregon)
Professor, Anthropology

DWYER, JEFFREY W., Ph.D. (University of Florida)
Associate Professor, Nursing

DYKES, MARY K., Ph.D. (University of Texas at Austin)
Professor, Special Education

DYSON, ALICE T., Ph.D. (University of Illinois)
Assistant Professor, Communication Processes and Disorders

EADES, JAMES L., Ph.D. (University of Illinois)
Associate Professor, Geology

EARLE, JONATHAN F., Ph.D. (University of Florida)
Associate Professor, Agricultural Engineering

EARLY, JOHN D., Ph.D. (Harvard University)
Professor, Anthropology

EARLY, MARGARET J., Ed.D. (Boston University)
Professor, Instruction and Curriculum

EAVERLY, MARY ANN, Ph.D. (University of Michigan)
Associate Professor, Classics

EBCIOGLU, IBRAHIM K., Ph.D. (University of Minnesota)
Professor, Aerospace Engineering, Mechanics, and Engineering Science

EBRAHIMI, FERESHTEH, Ph.D. (Colorado School of Mines)
Associate Professor, Materials Science and Engineering

ECHEVERRIA, EDGARDO J., Ph.D. (University of Florida)
Associate Professor, Horticultural Science

EDWARDS, BRUCE H., Ph.D. (Dartmouth College)
Professor, Mathematics

EDWARDSON, JOHN R., Ph.D. (Harvard University)
Professor, Agronomy

EDWARDSON, MICKIE N., Ph.D. (Michigan State University)
Distinguished Service Professor, Journalism and Communications

EHRLICH, PAUL E., Ph.D. (State University of New York at Stony Brook)
Professor, Mathematics

EICHHORN, HEINRICH K., Ph.D. (University of Vienna)
Professor, Astronomy

EISENBERG, JOHN F., Ph.D. (University of California at Berkeley)
Katharine Ordway Professor of Ecosystem Conservation

EISENBERG, MARTIN A., D.Eng. (Yale University)
Professor, Aerospace Engineering, Mechanics, and Engineering Science

EISENSTADT, WILLIAM R., Ph.D. (Stanford University)
Associate Professor, Electrical Engineering

EISSENSTAT, DAVID M., Ph.D. (Utah State University)
Associate Professor, Horticultural Science

ELLIFRITT, DUANE S., Ph.D. (West Virginia University)
Professor, Civil Engineering

ELLIOTT, MONICA L., Ph.D. (Montana State University)
Associate Professor, Plant Pathology

ELLIS, RALPH D., Ph.D. (University of Florida)
Assistant Professor, Civil Engineering

ELLIS, WILLIAM H., Ph.D. (Florida State University)
Associate Professor, Nuclear Engineering Sciences

ELLISON, GARY W., D.V.M. (University of Illinois)
Associate Professor, Veterinary Medicine

ELNICKI, RICHARD A., D.B.A. (Harvard University)
Professor, Decision and Information Sciences

ELZINGA, DONALD J., Ph.D. (Northwestern University)
Professor, Industrial and Systems Engineering

ELZO, MAURICIO A., Ph.D. (University of California at Davis)
Associate Professor, Animal Science

EMCH, GERARD G., Ph.D. (University of Geneva)
Professor, Mathematics

EMERSON, ROBERT D., Ph.D. (Purdue University)
Professor, Food and Resource Economics

EMERSON, ROBERT W., Ph.D. (Harvard University)
Assistant Professor, Management

EMMEL, THOMAS C., Ph.D. (Stanford University)
Professor, Zoology

ENHOLM, J. ERIC, Ph.D. (University of Utah)
Associate Professor, Chemistry

ENNEKING, WILLIAM F., M.D. (University of Wisconsin)
Distinguished Service Professor, Pathology and Laboratory Medicine

ENTNER, MARVIN L., Ph.D. (University of Minnesota)
Associate Professor, History

EPPES, BILL G., M.Arch. (University of Texas at Austin)
Professor, Building Construction

EPTING, FRANZ R., Ph.D. (Ohio State University)
Professor, Psychology

ERENGUC, SAHIN S., Ph.D. (Indiana University)
Professor, Decision and Information Sciences

ESSER, ROBERT P., Ph.D. (University of Florida)
Associate Professor, Entomology and Nematology

EVANS, DAVID H., Ph.D. (Stanford University)
Professor, Zoology

EWEL, JOHN J., Ph.D. (University of North Carolina)
Professor, Botany

EWEL, KATHERINE C., Ph.D. (University of Florida)
Professor, Forest Resources and Conservation

EYBERG, SHEILA M., Ph.D. (University of Oregon)
Professor, Clinical and Health Psychology

EYLER, FONDA D., Ph.D. (University of Florida)
Associate Professor, Psychology

EYLER, JOHN R., Ph.D. (Stanford University)
Professor, Chemistry

FAGERBERG, SEIGFRED W., Ed.D. (University of Southern Mississippi)
Professor, Health Science Education

FAGUNDO, FERNANDO E., Ph.D. (Cornell University)
Professor, Civil Engineering

FAHIEN, RAYMOND W., Ph.D. (Purdue University)
Professor, Chemical Engineering

FAIRCHILD, GARY F., Ph.D. (Texas A&M University)
Professor, Food and Resource Economics

FARBER, ERICH A., Ph.D. (University of Iowa)
Distinguished Service Professor, Mechanical Engineering

FARICY, JOHN H., Ph.D. (University of Minnesota)
Distinguished Service Professor, Marketing

FARRAH, SAMUEL R., Ph.D. (Pennsylvania State University)
Associate Professor, Microbiology and Cell Science

FARRAR, MICHAEL J., Ph.D. (Emory University)
Associate Professor, Psychology

FAST, THOMAS B., D.D.S. (Ohio State University)
Professor, Dentistry

FATHI, ALBERT, Ph.D. (University of Paris)
Professor, Mathematics

FATZINGER, CARL W., Ph.D. (North Carolina State University)
Associate Professor, Entomology and Nematology

FEAGIN, JOE R., Ph.D. (Harvard University)
Graduate Research Professor, Sociology

FEARN, RICHARD L., Ph.D. (University of Florida)
Professor, Aerospace Engineering, Mechanics, and Engineering Science

FEIERMAN, STEVEN, Ph.D. (Oxford University)
Professor, History

FELDHERR, CARL M., Ph.D. (University of Pennsylvania)
Professor, Anatomy and Cell Biology

FENNELL, EILEEN B., Ph.D. (University of Florida)
Professor, Clinical and Health Psychology

FENNELL, ROBERT S., M.D. (University of Florida)
Professor, Pharmacology and Therapeutics

FERGUSON, JAMES J., Ph.D. (University of California at Riverside)
Associate Professor, Horticultural Science

FERGUSON, MARY A., Ph.D. (University of Wisconsin)
Professor, Journalism and Communications

FERKOVICH, STEPHEN M., Ph.D. (University of Wyoming)
Associate Professor, Entomology and Nematology

FERL, ROBERT J., Ph.D. (Indiana University)
Professor, Botany

FIELD, RICHARD D., Ph.D. (University of California at Berkeley)
Professor, Physics

FIELDS, MICHAEL J., Ph.D. (Texas A&M University)
Professor, Animal Science

FIK, TIMOTHY J., Ph.D. (University of Arizona)
Associate Professor, Geography

FILLMER, HENRY T., Ph.D. (Ohio University)
Professor, Instruction and Curriculum

FINGER, KENNETH F., Ph.D. (University of Wisconsin)
Professor, Pharmacodynamics

FINLEY, MARTHA C., M.S. (Vanderbilt University)
Associate Professor, Physical Therapy

FISCHLER, IRA S., Ph.D. (Stanford University)
Professor, Psychology

FISCHLSCHWEIGER, WERNER, Ph.D. (University of Graz)
Professor, Oral Biology

FISHER, NORMA P., M.A.E. (University of Florida)
Associate Professor, Physical Therapy

FISHER, WALDO R., Ph.D. (University of Pennsylvania)
Professor, Biochemistry and Molecular Biology

FISHWICK, PAUL A., Ph.D. (University of Pennsylvania)
Associate Professor, Computer and Information Sciences

FITE, WILLIAM H., D.S.N. (University of Alabama in Birmingham)
Assistant Professor, Nursing

FITZ-COY, NORMAN G., Ph.D. (Auburn University)
Assistant Professor, Aerospace Engineering, Mechanics, and Engineering Science

FITZGERALD, LAWRENCE T., Ph.D. (University of Florida)
Associate Professor, Nuclear Engineering Sciences

FITZPATRICK, JOHN W., Ph.D. (Princeton University)
Professor, Forest Resources and Conservation

FLAMINIO, LIVIO, Ph.D. (Stanford University)
Assistant Professor, Mathematics

FLANEGAN, JAMES B., Ph.D. (University of Michigan)
Professor, Immunology and Medical Microbiology

FLANNERY, JOHN G., Ph.D. (University of California, Santa Barbara)
Assistant Professor, Neuroscience

FLANNERY, MARK J., Ph.D. (Yale University)
Barnett Banks Eminent Scholar of Finance

FLANNERY, MERLE E., Ed.D. (Pennsylvania State University)
Associate Professor, Art

FLINCHUM, DAVID M., Ph.D. (North Carolina State University)
Professor, Forest Resources and Conservation

FLINN, CAROL A., Ph.D. (University of Iowa)
Assistant Professor, English

FLUCK, RICHARD C., Ph.D. (North Carolina State University)
Professor, Agricultural Engineering

FOCKS, DANA A., Ph.D. (University of Florida)
Assistant Professor, Entomology and Nematology

FOLTZ, JOHN L., Ph.D. (University of Michigan)
Associate Professor, Entomology and Nematology

FORD, REBECCA S., Ph.D. (University of Iowa)
Assistant Professor, Sociology

FOREMAN, RONALD C., JR., Ph.D. (University of Illinois)
Associate Professor, English

FORGNONE, CHARLES J., Ed.D. (George Peabody College)
Professor, Special Education

FORMISANO, RONALD P., Ph.D. (Wayne State University)
Professor, History

FORRESTER, DONALD J., Ph.D. (University of California at Davis)
Professor, Veterinary Medicine

FOSSUM, JERRY G., Ph.D. (University of Arizona)
Professor, Electrical Engineering

FOSTER, MAELEE T., M.F.A. (Temple University)
Associate Professor, Architecture

FOUSE, SARAH B., M.M. (University of Kentucky)
Professor, Music

FOX, LESLIE E., D.V.M. (Michigan State University)
Assistant Professor, Veterinary Medicine

FOX, ROBERT M., Ph.D. (Auburn University)
Associate Professor, Electrical Engineering

FOX, THOMAS R., Ph.D. (University of Florida)
Assistant Professor, Soil and Water Science

FOX, WILLIAM M., Ph.D. (Ohio State University)
Professor, Management

FRANCIS, RICHARD L., Ph.D. (Northwestern University)
Professor, Industrial and Systems Engineering

FRANCIS, WAYNE L., Ph.D. (Indiana University)
Professor, Political Science

FRANCIS-FLOYD, RUTH, D.V.M. (University of Florida)
Associate Professor, Veterinary Medicine

FRANK, JOHN H., Ph.D. (Oxford University)
Professor, Entomology and Nematology

FRANKS, BRIDGET A., Ph.D. (University of Nebraska)
Assistant Professor, Foundations of Education

FRAZER, WILLIAM J., JR., Ph.D. (Columbia University)
Professor, Economics

FRAZIER, CHARLES E., Ph.D. (Southern Illinois University)
Professor, Sociology

FREEDMAN, STEVE A., Ph.D. (Florida State University)
Associate Professor, Health Services Administration

FREELAND, JAMES J., J.D. (University of Florida)
Distinguished Service Professor, Taxation

FREEMAN, THOMAS E., Ph.D. (Louisiana State University)
Professor, Plant Pathology

FREGLY, MARILYN S., Ph.D. (University of Florida)
Associate Professor, Journalism and Communications

FREGLY, MELVIN J., Ph.D. (University of Rochester)
Graduate Research Professor, Physiology

FRENCH, BYRON T., Ph.D. (Kansas State University)
Associate Professor, Agricultural Engineering

FRENCH, EDWIN C., Ph.D. (Texas A&M University)
Associate Professor, Agronomy

FRENCH, WILLIAM J., Ph.D. (Syracuse University)
Professor, Plant Pathology

FREUND, GERHARD, M.D. (Johann Wolfgang Goethe University)
Professor, Neuroscience

FRICKE, ARTHUR L., Ph.D. (University of Wisconsin)
Professor, Chemical Engineering

FRIEDMAN, WILLIAM A., M.D. (Ohio State University)
Professor, Neuroscience

FRIEL, MICHAEL K., LL.M. (New York University)
Professor, Taxation

FRISBY, CRAIG L., Ph.D. (University of California at Berkeley)
Associate Professor, Foundations of Education

FROST, SUSAN C., Ph.D. (University of Arizona)
Associate Professor, Biochemistry and Molecular Biology

FRY, JACK L., Ph.D. (Purdue University)
Professor, Poultry Science

FRY, JAMES N., Ph.D. (Princeton University)
Associate Professor, Physics

FU, LI-MIN, Ph.D. (Stanford University)
Assistant Professor, Computer and Information Sciences

FUKUYAMA, MARY A., Ph.D. (Washington State University)
Associate Professor, Counselor Education

FULTON, MICHAEL N., M.D. (University of Iowa)
Associate Professor, Exercise and Sport Sciences

FUNDERBURK, JOSEPH E., Ph.D. (Iowa State University)
Associate Professor, Entomology and Nematology

FURMAN, RICHARD, M.B.C. (University of Florida)
Assistant Professor, Building Construction

FURR, CONNIE L., M.A. (University of Tennessee-Knoxville)
Assistant Professor, Theatre

FUTTERKNECHT, FRANZ O., Ph.D. (University of Mannheim)
Professor, Germanic and Slavic Languages and Literatures

GABRIEL, DEAN W., Ph.D. (Michigan State University)
Associate Professor, Plant Pathology

GAFFNEY, JEROME J., M.S. (Pennsylvania State University)
Associate Professor, Agricultural Engineering

GAITANIS, LOUIS A., J.D. (University of Florida)
Professor, Finance, Insurance, and Real Estate

GAITHER, ROBERT B., Ph.D. (University of Illinois)
Professor, Mechanical Engineering

GALE, PAULA M., Ph.D. (University of Arkansas)
Assistant Professor, Soil and Water Science

GALLAHER, RAYMOND N., Ph.D. (University of Georgia)
Professor, Agronomy

GALLANT, THOMAS W., Ph.D. (Cambridge University)
Associate Professor, History

GAMBLE, DOVIE J., M.A. (New York University)
Assistant Professor, Exercise and Sport Sciences

GANDER, JOHN E., Ph.D. (University of Minnesota)
Professor, Microbiology and Cell Science

GANNON, MICHAEL V., Ph.D. (University of Florida)
Distinguished Service Professor, History

GANTA, ROMAN R., Ph.D. (Allms, New Dehli)
Assistant Scientist, Veterinary Medicine

GAPENSKI, LOUIS C., Ph.D. (University of Florida)
Associate Professor, Health Services Administration

GARCIA, RAUL B., M.C.P. (University of Pennsylvania)
Assistant Professor, Architecture

GARG, LAL C., Ph.D. (University of Florida)
Professor, Pharmacology and Therapeutics

GARNSEY, STEPHEN M., Ph.D. (University of California at Davis)
Associate Professor, Plant Pathology

GARRETT, EDWARD R., Ph.D. (Michigan State University)
Graduate Research Professor, Pharmaceutics

GARRIGUES, ROBERT G., Ph.D. (Florida State University)
Assistant Professor, Health Services Administration

GARVAN, FRANCIS G., Ph.D. (Pennsylvania State University)
Associate Professor, Mathematics

GARY, FAYE, Ed.D. (University of Florida)
Professor, Nursing

GASKIN, JACK M., Ph.D. (Cornell University)
Associate Professor, Immunology and Medical Microbiology and Veterinary Medicine

GATER, ROGER A., Ph.D. (Purdue University)
Associate Professor, Mechanical Engineering

GATLIN, DOUGLAS S., Ph.D. (University of North Carolina)
Professor, Political Science

GAY-CROSIER, RAYMOND, Ph.D. (University of Berne)
Professor, Romance Languages and Literatures

GEFFKEN, GARY R., Ph.D. (University of Florida)
Associate Professor, Clinical and Health Psychology

GEGGUS, DAVID P., Ph.D. (York University)
Professor, History

GEISER, EDWARD A., M.D. (University of Cincinnati)
Assistant Professor, Computer and Information Sciences

GEISSER, MICHAEL E., Ph.D. (Chicago Medical School)
Assistant Professor, Clinical and Health Psychology

GELATT, KIRK N., V.M.D. (University of Pennsylvania)
Professor, Animal Science and Veterinary Medicine

GEORGE, PAUL S., Ed.D. (George Peabody College)
Professor, Educational Leadership

GERBER, JOHN F., Ph.D. (University of Missouri)
Professor, Horticultural Science

GERENCSER, GEORGE A., Ph.D. (Indiana University)
Professor, Physiology

GERHARDT, KENNETH J., Ph.D. (Ohio State University)
Professor, Communication Processes and Disorders

GHOLZ, HENRY L., Ph.D. (Oregon State University)
Professor, Forest Resources and Conservation

GHOSH, MALAY, Ph.D. (University of North Carolina)
Professor, Statistics

GIBBS, CHARLES H., Ph.D. (Case Western Reserve University)
Professor, Oral Biology

GIBBS, EDWARD P., Ph.D. (University of Bristol)
Professor, Immunology and Medical Microbiology and Veterinary Medicine

GIBLIN-DAVIS, ROBIN M., Ph.D. (University of California at Davis)
Associate Professor, Entomology and Nematology

GIBSON, DAVID W., M.S.C.E. (University of Miami)
Associate Professor, Civil Engineering

GIESEL, JAMES T., Ph.D. (University of Oregon)
Associate Professor, Zoology

GIFFORD, GEORGE E., Ph.D. (University of Minnesota)
Professor, Immunology and Medical Microbiology

GILBERT, CARTER, Ph.D. (University of Michigan)
Professor, Zoology

GILES, GEOFFREY J., Ph.D. (Cambridge University)
Associate Professor, History

GILMAN, EDWARD F., Ph.D. (Rutgers State University)
Associate Professor, Horticultural Science

GILREATH, JAMES P., Ph.D. (University of Florida)
Associate Professor, Horticultural Science

GIOVANE, FRANK, Ph.D. (University of Pennsylvania)
Associate Research Scientist, Astronomy

GLADWIN, CHRISTINA H., Ph.D. (Stanford University)
Professor, Food and Resource Economics

GLOVER, JOSEPH, Ph.D. (University of California at San Diego)
Professor, Mathematics

GMITTER, FREDERICK G., Ph.D. (University of Florida)
Associate Professor, Horticultural Science

GODBEY, KAROLYN L., Ph.D. (Florida State University)
Associate Professor, Nursing

GODDARD, FREDERICK O., Ph.D. (Duke University)
Associate Professor, Economics

GOERTZ, GARY D., Ph.D. (University of Michigan)
Assistant Professor, Political Science

GOLANT, STEPHEN M., Ph.D. (University of Washington)
Professor, Geography

GOLDBERG, EUGENE P., Ph.D. (Brown University)
Professor, Materials Science and Engineering

GOLDMAN, ABRAHAM C., Ph.D. (Clark University)
Assistant Professor, Geography

GOLDMAN, JACQUELIN R., Ph.D. (University of Illinois)
Professor, Clinical and Health Psychology

GOLDSTEIN, LEWIS P., Ph.D. (University of Kansas)
Assistant Professor, Communication Processes and Disorders

GONZALEZ, GERARDO M. Ph.D. (University of Florida)
Professor, Counselor Education

GONZALEZ-ROTHI, LESLIE J., Ph.D. (University of Florida)
Associate Professor, Communication Processes and Disorders

GOODENOW, MAUREEN M., Ph.D. (Albert Einstein College of Medicine)
Assistant Professor, Pathology and Laboratory Medicine

GORBET, DANIEL W., Ph.D. (Oklahoma State University)
Professor, Agronomy

GORDON, ANDREW M., Ph.D. (University of California at Berkeley)
Associate Professor, English

GORDON, DORIA R., Ph.D. (University of California at Davis)
Assistant Professor, Botany

GORDON, JOHN R., Ph.D. (University of Wisconsin)
Professor, Food and Resource Economic

GORDON, MICHAEL W., M.A. (Trinity College)
Professor, Latin American Studies

GORMAN, BENJAMIN L., Ph.D. (Tulane University)
Professor, Sociology

GOSWAMI, DHAVENDRA Y., Ph.D. (Auburn University)
Professor, Mechanical Engineering

GOTTESMAN, STEPHEN T., Ph.D. (University of Manchester)
Professor, Astronomy

GOTTWALD, TIM R., Ph.D. (Oregon State University)
Associate Professor, Plant Pathology

GOULD, ROBERT W., Ph.D. (University of Florida)
Professor, Materials Science and Engineering

GRAETZ, DONALD A., Ph.D. (University of Wisconsin)
Professor, Soil and Water Science

GRAHAM, ELIZABETH P., D.M. (Florida State University)
Associate Professor, Music

GRAHAM, JAMES H., JR., Ph.D. (Oregon State University)
Professor, Soil and Water Science

GRAHAM, MARY V., Ph.D. (University of Texas)
Associate Professor, Nursing

GRAHAM, WENDY D., Ph.D. (Massachusetts Institute of Technology)
Assistant Professor, Agricultural Engineering

GRAHAM-POLE, JOHN, M.D. (University of London)
Professor, Clinical and Health Psychology

GRAMS, R.R., M.D. (University of Minnesota)
Professor, Pathology and Laboratory Medicine

GRATER, HARRY A., JR., Ph.D. (Pennsylvania State University)
Professor, Psychology

GRAVENSTEIN, JOACHIM S., M.D. (Harvard University)
Graduate Research Professor, Anesthesiology

GRAVES, JAMES E., Ph.D. (University of Massachusetts)
Associate Scientist, Exercise and Sport Sciences

GRAY, DENNIS J., Ph.D. (North Carolina State University)
Professor, Horticultural Science

GREANY, PATRICK D., Ph.D. (University of California at Riverside)
Associate Professor, Entomology and Nematology

GREEN, ALEX E., Ph.D. (University of Cincinnati)
Graduate Research Professor, Mechanical Engineering

GREEN, DAVID M., Ph.D. (University of Michigan)
Graduate Research Professor, Psychology

GREEN, KATHRYN, Ph.D. (Indiana University)
Assistant Professor, History

GREENBERG, MICHAEL J., Ph.D. (Harvard University)
Professor, Pharmacology and Therapeutics

GREENE, ANTHONY F., Ph.D. (University of South Florida)
Assistant Professor, Clinical and Health Psychology

GREENE, BARRY R., Ph.D. (St. Louis University)
Professor, Health Services Administration

GREENWOOD, GORDON E., Ed.D. (Indiana University)
Professor, Foundations of Education

GREGER, DEBORA, M.F.A. (University of Iowa)
Professor, English

GREGG, ANDREA C., M.S.N. (Medical College of Georgia)
Assistant Professor, Nursing

GREGORY, FREDERICK G., Ph.D. (Harvard University)
Professor, History

GREGORY, JESSE F., III, Ph.D. (Michigan State University)
Professor, Food Science and Human Nutrition

GREGORY, JOHN W., Ph.D. (Ohio State University)
Professor, Instruction and Curriculum

GREINER, ELLIS C., Ph.D. (University of Nebraska)
Professor, Veterinary Medicine

GRIFFIN, CYNTHIA C., Ph.D. (Purdue University)
Assistant Professor, Special Education

GRIFFIN, DANA G., III, Ph.D. (University of Tennessee)
Professor, Botany

GRIFFITH, JOHN L., Ed.D. (Oklahoma State University)
Professor, Journalism and Communications

GRIFFITHS, SCOTT K., Ph.D. (University of Illinois)
Assistant Professor, Communication Processes and Disorders

GRIGGS, RICHARD A., Ph.D. (Indiana University)
Professor, Psychology

GRIMES, CHURCHILL B., Ph.D. (University of North Carolina)
Associate Professor, Forest Resources and Conservation

GRINDAL, BRUCE T., Ph.D. (Indiana University)
Professor, Anthropology

GRIST, ROBERT R., M.L.A. (University of Georgia)
Associate Professor, Landscape Architecture

GROISSER, DAVID J., Ph.D. (Harvard University)
Associate Professor, Mathematics

GRONWALL, RONALD R., Ph.D. (University of California at Davis)
Professor, Veterinary Medicine

GROPPEL, JACK L., Ph.D. (Florida State University)
Associate Professor, Exercise and Sport Sciences

GROSENBAUGH, LEWIS R., M.F. (Yale University)
Professor, Forest Resources and Conservation

GROSSBART, STEPHEN R., Ph.D. (University of Michigan)
Assistant Professor, History

GROSSER, JUDE W., Ph.D. (University of Kentucky)
Associate Professor, Horticultural Science

GRUNDY, BETTY L., M.D. (University of Florida)
Professor, Pharmacy

GUBRIUM, JABER F., Ph.D. (Wayne State University)
Professor, Sociology

GUERTIN, WILSON H., Ph.D. (Michigan State University)
Professor, Foundations of Education

GUILLETTE, LOUIS J., JR., Ph.D. (University of Colorado)
Professor, Zoology

GUINAGH, BARRY J., Ph.D. (Michigan State University)
Associate Professor, Foundations of Education

GULIG, PAUL A., Ph.D. (University of Texas at Houston)
Assistant Professor, Immunology and Medical Microbiology

GUNDERSEN, MARTIN G., M.A.Arch. (University of Florida)
Associate Professor, Architecture

GUPTA, VIRENDRA K., Sc.D. (University of Michigan)
Professor, Entomology and Nematology

GURLEY, WILLIAM B., Ph.D. (University of Georgia)
Associate Professor, Microbiology and Cell Science

GURUCHARRI, MARIA C., M.L.A. (Harvard University)
Assistant Professor, Landscape Architecture

GUSTAFSON, BO A., Ph.D. (Lund University)
Associate Scientist, Astronomy

GUTEKUNST, RICHARD R., Ph.D. (Cornell University)
Professor, Immunology and Medical Microbiology

GUTTINGER, HELLEN T., Ed.D. (University of Florida)
Associate Professor, Instruction and Curriculum

GUY, CHARLES L., Ph.D. (University of Minnesota)
Associate Professor, Horticultural Science

GUYER, LAURA K., Ph.D. (University of Florida)
Assistant Professor, Food Science and Human Nutrition

GUZMAN, NICOLAS J., M.D. (Cayetano Heredia University)
Assistant Professor, Pharmacology and Therapeutics

HAASE, RONALD W., B.Arch (University of Minnesota)
Professor, Architecture

HABECK, DALE H., Ph.D. (North Carolina State University)
Professor, Entomology and Nematology

HACKENBERG, TJMOTHY D., Ph.D. (Temple University)
Assistant Professor, Psychology

HACKENBRACK, KARL E., Ph.D. (Ohio State University)
Assistant Professor, Accounting

HACKETT, DAVID G., Ph.D. (Emory University)
Associate Professor, Religion

HACKETT, RAYMOND L., M.D. (University of Vermont)
Professor, Pathology and Laboratory Medicine

HAGER, WILLIAM W., Ph.D. (Massachusetts Institute of Technology)
Professor, Mathematics

HAILE, DANEL G., Ph.D. (Texas A&M University)
Assistant Professor, Agricultural Engineering

HALE, MARK P., JR., Ph.D. (University of IIIlinois)
Associate Professor, Mathematics

HALL, DONALD W., Ph.D. (University of Florida)
Professor, Entomology and Nematology

HALL, EVERETTE E., Ph.D. (University of Florida)
Associate Professor, Psychology

HALL, HARLAN G., Ph.D. (University of California at Berkeley)
Associate Professor, Entomology and Nematology

HALL, HOWARD J., Ph.D. (University of Georgia)
Assistant Professor, Management

HALLER, WILLIAM T., Ph.D. (University of Florida)
Professor, Agronomy

HALLMAN, CLEMENS L., Ph.D. (Indiana University)
Professor, Instruction and Curriculum

HAMACHER, HORST W., Ph.D. (University of Cologne)
Associate Professor, Industrial and Systems Engineering

HAMAN, DOROTA Z., Ph.D. (Michigan State University)
Associate Professor, Agricultural Engineering

HAMILTON, JONATHAN H., Ph.D. (Massachusetts Institute of Technology)
Associate Professor, Economics

HAMMER, JACOB, Ph.D. (Israel Institute of Technology)
Professor, Electrical Engineering

HAMMER, LOWELL C., Ph.D. (University of Florida)
Professor, Communication Processes and Disorders

HAMMER, RICHARD H., Ph.D. (University of Arizona)
Professor, Pharmaceutics

HAMMOND, ANDREW C., Ph.D. (Washington State University)
Associate Professor, Animal Science

HAMMOND, FRANKIE A., M.A. (University of Florida)
Associate Professor, Journalism and Communications

HAMMOND, LUTHER C., Ph.D. (Iowa State University)
Professor, Soil and Water Science

HANDLER, ALFRED M., Ph.D. (University of Oregon)
Assistant Professor, Entomology and Nematology

HANES, DANIEL M., Ph.D. (University of California at San Diego)
Associate Professor, Coastal and Oceanographic Engineering

HANLON, EDWARD A., JR., Ph.D. (Oklahoma State University)
Associate Professor, Soil and Water Science

HANNAH, LARKIN C., Ph.D. (University of Wisconsin)
Professor, Horticultural Science

HANRAHAN, ROBERT J., Ph.D. (University of Wisconsin)
Professor, Chemistry

HANSEN, ART, Ph.D. (Cornell University)
Associate Professor, Anthropology

HANSEN, ELMER C., Ph.D. (Iowa State University)
Assistant Professor, Mechanical Engineering

HANSEN, PETER J., Ph.D. (University of Wisconsin)
Professor, Dairy Science

HANSON, ERIC N., Ph.D. (University of California at Berkeley)
Assistant Professor, Computer and Information Sciences

HARBAUGH, BRENT K., Ph.D. (Kansas State University)
Professor, Horticultural Science

HARBISON, RAYMOND D., Ph.D. (University of Iowa)
Professor, Pathology and Laboratory Medicine

HARDMAN-DE-BAUTISTA, MARTHA J., Ph.D. (Stanford University)
Professor, Anthropology

HARDY, JOHN W., Ph.D. (Kansas State University)
Professor, Zoology

HARE, RICHARD M., Lit. Hum. (Oxford University)
Graduate Research Professor, Philosophy

HARGRAVE, PAUL A., Ph.D. (University of Minnesota)
Professor, Biochemistry and Molecular Biology

HARGROVE, DON D., Ph.D. (University of Florida)
Professor, Animal Science

HARING, ELLEN S., Ph.D. (University of Vienna)
Professor, Philosophy

HARMON, ALICE C., Ph.D. (St. John's University)
Assistant Professor, Botany

HARMS, ROBERT H., Ph.D. (Texas A&M University)
Graduate Research Professor, Poultry Science

HARRELL, ROY C., Ph.D. (Washington State University)
Associate Professor, Agricultural Engineering

HARRIS, BARNEY, JR., Ph.D. (Oklahoma State University)
Professor, Dairy Science

HARRIS, JAMES O., M.D. (University of Mississippi)
Professor, Medicine

HARRIS, LAWRENCE D., Ph.D. (Michigan State University)
Professor, Forest Resources and Conservation

HARRIS, MARVIN, Ph.D. (Columbia University)
Graduate Research Professor, Anthropology

HARRIS, WILLIE G., Ph.D. (Virginia Polytechnic Institute)
Associate Professor, Soil and Water Science

HARRISON, NIGEL A., Ph.D. (University of Rhode Island)
Associate Professor, Plant Pathology

HARRISON, WILLARD W., Ph.D. (University of Illinois)
Professor, Chemistry

HARTIGAN, KARELISA V., Ph.D. (University of Chicago)
Professor, Classics

HARTLE, LYNN C., Ph.D. (Pennsylvania State University)
Assistant Professor, Instruction and Curriculum

HARVEY, JOHN W., Ph.D. (University of California at Davis)
Professor, Veterinary Medicine

HASELL, MARY J., D. Arch. (University of Michigan)
Associate Professor, Architecture

HASSELL, THOMAS M., Ph.D. (University of Washington)
Professor, Oral Biology

HATCH, ROBERT A., Ph.D. (University of Wisconsin)
Associate Professor, History

HATFIELD, KIRK, Ph.D. (University of Massachusetts)
Associate Professor, Civil Engineering

HATZICHRONOGLOU, HELEN, Ph.D. (Johns Hopkins University)
Assistant Professor, Classics

HAUSWIRTH, WILLIAM W., Ph.D. (Oregon State University)
Eminent Scholar, Immunology and Medical Microbiology

HAWKINS, IRVIN F., M.D. (University of Maryland)
Professor, Radiology

HAYDU, JOHN J., Ph.D. (Michigan State University)
Assistant Professor, Food and Resource Economics

HAYNES, RICHARD P., Ph.D. (University of Illinois)
Associate Professor, Philosophy

HAYS, CLIFFORD O., JR., Ph.D. (University of Texas at Austin)
Professor, Civil Engineering

HEAD, HENRY H., Ph.D. (University of Maryland)
Professor, Dairy Science

HEARN, DONALD W., Ph.D. (Johns Hopkins University)
Professor, Industrial and Systems Engineering

HEATON, MARIETA B., Ph.D. (University of North Carolina)
Professor, Neuroscience

HEDGE, DAVID M., Ph.D. (University of Wisconsin)
Associate Professor, Political Science

HEESACKER, MARTIN, Ph.D. (University of Missouri)
Associate Professor, Psychology

HEFT, MARC W., Ph.D. (American University)
Professor, Clinical and Health Psychology

HEFTI, ARTHUR F., D.D.S. (University of Zurich)
Professor, Oral Biology

HEGGESTAD, ARNOLD A., Ph.D. (Michigan State University)
Professor, Economics

HEILMAN, KENNETH M., M.D. (University of Virginia)
Professor, Clinical and Health Psychology

HEINS, PAUL J., M.S.D. (University of Washington)
Professor, Dentistry

HEIPP, RICHARD C., M.F.A. (University of Washington)
Associate Professor, Art

HELLING, JOHN F., Ph.D. (Ohio State University)
Professor, Chemistry

HEMBRY, F. GLEN, Ph.D. (University of Missouri)
Professor, Animal Science

HEMP, GENE W., Ph.D. (University of Minnesota)
Professor, Aerospace Engineering, Mechanics, and Engineering Science

HENCH, LARRY L., Ph.D. (Ohio State University)
Graduate Research Professor, Materials Science and Engineering

HENDELES, LESLIE, Pharm.D. (University of Southern California)
Professor, Pharmacy Practice

HENDRICKS, JAMES B., Ph.D. (University of Wisconsin, Madison)
Assistant Professor, Pathology and Laboratory Medicine

HENLEY, RICHARD W., Ph.D. (Ohio State University)
Professor, Horticultural Science

HENNY, RICHARD J., Ph.D. (University of Minnesota)
Professor, Horticultural Science

HENRETTA, JOHN C., Ph.D. (Harvard University)
Professor, Sociology

HENRY, G.S., Ph.D. (Yale University)
Assistant Professor, History

HENRY, JAMES A., Ph.D. (University of Kansas)
Associate Professor, Geography

HENSEL, DALE R., Ph.D. (Rutgers State University)
Professor, Soil and Water Science

HENSEL, JAMES W., Ph.D. (Iowa State University)
Professor, Educational Leadership

HEPLER, CHARLES D., Ph.D. (University of Iowa)
Professor, Pharmacy

HEPPNER, JOHN B., Ph.D. (University of Florida)
Assistant Professor, Entomology and Nematology

HERBSMAN, ZOHAR, D.Sc. (Israel Institute of Technology)
Professor, Civil Engineering

HERSHFIELD, SELMAN PHILIP, Ph.D. (Cornell University)
Assistant Professor, Physics

HERZOG, DONALD C., Ph.D. (Louisiana State University)
Professor, Entomology and Nematology

HIEBERT, ERNEST, Ph.D. (Purdue University)
Professor, Plant Pathology

HIEBSCH, CLIFTON K., Ph.D. (North Carolina State University)
Associate Professor, Agronomy

HIERS, RICHARD H., Ph.D. (Yale University)
Professor, Religion

HIETT, SHARON L., Ph.D. (University of Florida)
Assistant Professor, Instruction and Curriculum

HILDEBRAND, PETER E., Ph.D. (Michigan State University)
Professor, Food and Resource Economics

HILL, ORRY C., M.A.Arch. (University of Florida)
Associate Professor, Architecture

HILL, SAMUEL S., JR., Ph.D. (Duke University)
Professor, Religion

HILL-LUBIN, MILDRED A., Ph.D. (University of Illinois)
Associate Professor, English

HILLIARD, MARY E., Ph.D. (University of Florida)
Professor, Nursing

HILLMAN, JEFFREY D., Ph.D. (Harvard University)
Professor, Oral Biology

HINSON, KUELL, Ph.D. (University of Wisconsin)
Professor, Agronomy

HINTENLANG, DAVID E., Ph.D. (Brown University)
Assistant Professor, Nuclear Engineering Sciences

HIRKO, ROBERT J., Ph.D. (Carnegie Mellon University)
Associate Engineer, Aerospace Engineering, Mechanics, and Engineering Science

HIRSCHFELD, PETER J., Ph.D. (Princeton University)
Assistant Professor, Physics

HO, CHAT-YIN, Ph.D. (University of Chicago)
Professor, Mathematics

HO, TING-JUI, Ph.D. (Indiana University)
Associate Professor, Anthropology

HOCHHAUS, GUENTHER, Ph.D. (University of Muenster)
Associate Professor, Pharmaceutics

HOCKMUTH, GEORGE J., Ph.D. (University of Wisconsin)
Associate Professor, Horticultural Science

HODELL, DAVID A., Ph.D. (University of Rhode Island)
Associate Professor, Geology

HOFER, ADELINE, MArch (University of Florida)
Assistant Professor, Architecture

HOFFER, CHARLES R., Ph.D. (Michigan State University)
Professor, Music

HOFFMANN, EDWARD M., Ph.D. (University of Miami)
Professor, Microbiology and Cell Science

HOFLUND, GAR B., Ph.D. (University of California at Berkeley)
Professor, Chemical Engineering

HOGSETTE, JEROME A., Ph.D. (University of Florida)
Assistant Professor, Entomology and Nematology

HOIT, MARC I., Ph.D. (University of California at Berkeley)
Associate Professor, Civil Engineering

HOJJATIE, BAHRAM, Ph.D. (University of Florida)
Assistant Scientist, Materials Science and Engineering

HOLLAND, HAROLD F., M.S.C.E. (University of Florida)
Professor, Building Construction

HOLLAND, NORMAN N., Ph.D. (Harvard University)
Marston/Milbauer Professor of English

HOLLAND, STEPHEN, Ph.D. (Texas A&M University)
Associate Professor, Recreation, Parks, and Tourism

HOLLIEN, HARRY F., Ph.D. (University of Iowa)
Professor, Linguistics

HOLLING, CRAWFORD S., Ph.D. (University of British Columbia)
Arthur J. Marshall, Jr., Professor of Ecological Sciences

HOLLINGER, RICHARD C., Ph.D. (University of Minnesota)
Associate Professor, Sociology

HOLLINGER, THOMAS G., Ph.D. (Purdue University)
Associate Professor, Anatomy and Cell Biology

HOLLINGSWORTH, HEATHER L., M.F.A. (University of Texas at Austin)
Assistant Professor, Theatre

HOLLOWAY, PAUL H., Ph.D. (Rensselaer Polytechnic Institute)
Professor, Materials Science and Engineering

HOLMES, ALICE E., Ph.D. (Pennsylvania State University)
Associate Professor, Communication Processes and Disorders

HOLT, JOHN, Ph.D. (Texas A&M University)
Professor, Food and Resource Economics

HOLYOAK, OWEN J., Ph.D. (University of Iowa)
Professor, Exercise and Sport Sciences

HOMAN, SIDNEY R., JR., Ph.D. (Harvard University)
Professor, English

HOMER, BRUCE L., Ph.D., (Texas A&M University)
Associate Professor, Veterinary Medicine

HONEYMAN, DAVID S., Ph.D. (University of Virginia)
Associate Professor, Educational Leadership

HOOKS, EUGENE J., Ph.D. (University of Missouri)
Professor, Theatre

HOOPER, CHARLES F., JR., Ph.D. (Johns Hopkins University)
Professor, Physics

HOOPER, LEONARD J., JR., Ph.D. (Southern Illinois University)
Professor, Journalism and Communications

HOOVER, NORA L., Ed.D. (Virginia Polytechnic Institute)
Associate Professor, Instruction and Curriculum

HOOVER, TRACY S., Ph.D. (Pennsylvania State University)
Assistant Professor, Agricultural Education and Communication

HOPKINS, DONALD L., Ph.D. (University of Kentucky)
Professor, Plant Pathology

HORNBERGER, ROBERT H., Ph.D. (University of Iowa)
Assistant Professor, Psychology

HORNSBY, ARTHUR G., Ph.D. (Oklahoma State University)
Professor, Soil and Water Science

HORODYSKI, MARYBETH, Ph.D., (Columbia University)
Assistant Professor, Exercise and Sport Sciences

HOROWITZ, ANN R., Ph.D. (Indiana University)
Associate Professor, Economics

HOROWITZ, IRA, Ph.D. (Massachusetts Institute of Technology)
Graduate Research Professor, Decision and Information Sciences

HOUSTON, JOEL F., Ph.D. (University of Pennsylvania)
Assistant Professor, Finance, Insurance, and Real Estate

HOWARD, F. WILLIAM, Ph.D. (Louisiana State University)
Associate Professor, Entomology and Nematology

HOWARD-HAMILTON, MARY E., Ed.D. (North Carolina State University)
Assistant Professor, Counselor Education

HOY, MARJORIE A., Ph.D. (University of California at Berkeley))
Eminent Scholar, Entomology and Nematology

HSIEH, CHUNG K., Ph. D. (Purdue University)
Professor, Mechanical Engineering

HSU, CHEN-CHI, Ph.D. (University of Michigan)
Professor, Aerospace Engineering, Mechanics, and Engineering Science

HSU, JIN-WEN Y., Ph.D. (University of California at Los Angeles)
Assistant Professor, Foundations of Education

HUBBELL, DAVID H., Ph.D. (North Carolina State University)
Professor, Soil and Water Science

HUBER, DONALD J., Ph.D. (Iowa State University)
Professor, Horticultural Science

HUCKSHORN, ROBERT J., Ph.D. (State University of Iowa)
Professor, Political Science

HUDSON, DAVID M., J.D. (Florida State University)
Professor, Taxation

HUGHES, HOLLY E., D.A. (Ball State University)
Assistant Professor, Music

HUMMEL, R.E., Ph.D. (Max Planck Institute)
Professor, Materials Science and Engineering

HUMPHREY, STEPHEN R., Ph.D. (Oklahoma State University)
Professor, Forest Resources and Conservation

HUMPHREYS, THOMAS E., Ph.D. (University of Pennsylvania)
Professor, Horticultural Science

HUMPHREYS-BEHER, MICHAEL G., Ph.D. (University of Virginia)
Associate Professor, Oral Biology

HUNTER, BRUCE E., Ph.D. (University of Florida)
Associate Professor, Neuroscience

HUNTER, JAMES H., Ph.D. (University of California at Los Angeles)
Professor, Astronomy

HURT, JEFF A., Ph.D. (University of Kansas)
Associate Professor, Instruction and Curriculum

HUTCHINSON, JOHN W., Ph.D. (Stanford University)
Associate Professor, Marketing

HUTCHINSON, SALLY A., Ph.D. (University of Florida)
Professor, Nursing

HYDEN, GORAN S., Ph.D. (University of Lund)
Professor, Political Science

HYNES, MICHAEL C., Ph.D. (Kent State University)
Associate Professor, Instruction and Curriculum

IAFRATE, PETER, Ph.D. (University of Florida)
Assistant Professor, Pharmacy Practice

IHAS, GARY G., Ph.D. (University of Michigan)
Professor, Physics

INDELICATO, PETER A., M.D. (New York Medical College)
Professor, Exercise and Sport Sciences

INGERSENT, J. KEVIN, Ph.D. (University of Pennsylvania)
Assistant Professor, Physics

INGLEY, HERBERT A., III, Ph.D. (University of Florida)
Associate Professor, Mechanical Engineering

INGRAM, LONNIE O., Ph.D. (University of Texas at Austin)
Professor, Microbiology and Cell Science

IPSER, JAMES R., Ph.D. (California Institute of Technology)
Professor, Physics

ISAACS, GERALD W., Ph.D. (Michigan State University)
Professor, Agricultural Engineering

ISAACSON, MARCIA J., M.F.A. (University of Georgia)
Professor, Art

ISCAN, M. YASAR, Ph.D. (Cornell University)
Professor, Anthropology

ISENBERG, SHELDON R., Ph.D. (Harvard University)
Associate Professor, Religion

ISMAIL, MOHAMED A., Ph.D. (University of Florida)
Professor, Horticultural Science

ISRAEL, GLEN D., Ph.D. (Pennsylvania State University)
Assistant Professor, Agricultural Education and Communication

ISSA, R. RAYMOND, Ph.D. (Mississippi State University)
Associate Professor, Building Construction

IWATA, BRIAN, Ph.D. (Florida State University)
Professor, Psychology

IZUNO, FORREST T., Ph.D. (Colorado State University)
Associate Professor, Agricultural Engineering

JACKSON, LARRY K., Ph.D. (University of Florida)
Professor, Horticultural Science

JACOBS, ALAN M., Ph.D. (Pennsylvania State University)
Professor, Nuclear Engineering Sciences

JACOBS, FRANCES L., Ph.D. (University of Florida)
Assistant Professor, Nursing

JACOBSON, ELLIOTT R., Ph.D. (University of Missouri)
Professor, Veterinary Medicine

JACOBSON, SUSAN K., Ph.D. (Duke University)
Assistant Scientist, Forest Resources and Conservation

JAEGER, MARC, M.D. (University of Berne)
Professor, Physiology

JAMES, CHRISTOPHER M., Ph.D. (University of Michigan)
Sun Bank Professor, Finance, Insurance, and Real Estate

JAMES, JOHN H., D.B.A. (Indiana University)
Associate Professor, Management

JAMES, MARGARET O., Ph.D. (University of London)
Professor, Medicinal Chemistry

JANISZEWSKI, CHRIS A., Ph.D. (Northwestern University)
Associate Professor, Marketing

JENKINS, DAVID A., Ph.D. (University of Florida)
Associate Engineer, Aerospace Engineering, Mechanics, and Engineering Science

JENNINGS, ARTHUR C., D.M.A. (University of Arizona)
Associate Professor, Music

JENSEN, PAUL J., Ph.D. (University of Iowa)
Professor, Communication Processes and Disorders

JENSEN, ROY A., Ph.D. (University of Texas)
Professor, Microbiology and Cell Science

JIMENEZ, REYNALDO L., Ph.D. (University of Illinois)
Associate Professor, Romance Languages and Literatures

JOHNS, LEWIS E., JR., Ph.D. (Carnegie-Mellon University)
Professor, Chemical Engineering

JOHNSON, CALVIN M., Ph.D. (North Carolina State University)
Assistant Professor, Veterinary Medicine

JOHNSON, D. DWAIN, Ph.D. (Texas A&M University)
Associate Professor, Animal Science

JOHNSON, EDWARD L., Ph.D. (University of Missouri)
Associate Professor, Animal Science

JOHNSON, FRED C., II, Ph.D. (University of Texas at Austin)
Professor, Zoology

JOHNSON, FREDDIE A., Ph.D. (University of Florida)
Professor, Entomology and Nematology

JOHNSON, HOWARD M., Ph.D. (Ohio State University)
Graduate Research Professor, Microbiology and Cell Science

JOHNSON, JAMES H., Ph.D. (Northern Illinois University)
Professor, Clinical and Health Psychology

JOHNSON, JON D., Ph.D. (Oregon State University)
Associate Professor, Forest Resources and Conservation

JOHNSON, KATHLEEN E., Ph.D. (Northwestern University)
Assistant Professor, Geology

JOHNSON, RALPH B., M.Arch. (Yale University)
Associate Professor, Building Construction

JOHNSON, RANDAL, Ph.D. (University of Texas at Austin)
Professor, Romance Languages and Literatures

JOHNSON, RICHARD D., Ph.D. (University of California at Davis)
Associate Professor, Veterinary Medicine

JOHNSON, SIMON O., Ed.D. (Indiana University)
Professor, Instruction and Curriculum

JOHNSON, SUZANNE B., Ph.D. (State University of New York at Stony Brook)
Professor, Clinical and Health Psychology

JOHNSON, THEODORE J., Ph.D. (New York University)
Assistant Professor, Computer and Information Sciences

JOHNSTON, CLIFFORD T., Ph.D. (University of California at Riverside)
Associate Professor, Soil and Water Science

JOHNSTON, OTTO W., Ph.D. (Princeton University)
Associate Professor, Germanic and Slavic Languages and Literatures

JOINER, JAMES, Ph.D. (University of Alabama)
Associate Professor, Rehabilitation Counseling

JOKELA, ERIC J., Ph.D. (State University of New York)
Associate Professor, Forest Resources and Conservation

JONES, ANNE G., Ph.D. (University of North Carolina at Chapel Hill)
Associate Professor, English

JONES, DAVID A., D.Phil. (University of Oxford)
Professor, Botany

JONES, DAVID B., Ph.D. (University of California at Davis)
Associate Professor, Agronomy

JONES, DOUGLAS S., Ph.D. (Princeton University)
Professor, Geology

JONES, JAMES W., Ph.D. (North Carolina State University)
Professor, Agricultural Engineering

JONES, JEFFREY B., Ph.D. (Virginia Polytechnic Institute)
Professor, Plant Pathology

JONES, JOHN P., Ph.D. (Ohio State University)
Professor, Plant Pathology

JONES, KEVIN S., Ph.D. (University of California at Berkeley)
Associate Professor, Materials Science and Engineering

JONES, LINDA K., Ph.D. (University of Georgia)
Associate Professor, Instruction and Curriculum

JONES, PIERCE H., Ph.D. (University of Florida)
Associate Professor, Agricultural Engineering

JONES, WILLIAM M., Ph.D. (University of Southern California)
Distinguished Service Professor, Chemistry

JONG, SONG MUH JOHNSON, Ph.D. (Rockefeller University of New York)
Assistant Professor, Pathology and Laboratory Medicine

JOYCE, JOSEPH C., Ph.D. (University of Florida)
Professor, Agronomy

JUDD, WALTER S., Ph.D. (Harvard University)
Professor, Botany

KALMAN, RUDOLF E., D.Sci. (Columbia University)
Graduate Research Professor, Electrical Engineering

KALMBACHER, ROBERT S., Ph.D. (Pennsylvania State University)
Professor, Agronomy

KALRA, SATYA P., Ph.D. (University of Delhi)
Professor, Obstetrics and Gynecology

KAMEL, NABEL N., Ph.D. (University of Colorado)
Assistant Professor, Computer and Information Sciences

KANDRUP, HENRY E., Ph.D. (University of Chicago)
Associate Professor, Astronomy

KANE, MICHAEL E., Ph.D. (University of Rhode Island)
Associate Professor, Horticultural Science

KANTOWSKI, ELEANORE L., Ed.D. (University of Georgia)
Professor, Instruction and Curriculum

KAO, KUO-JANG, Ph.D. (Duke University)
Associate Professor, Pathology and Laboratory Medicine

KAPLAN, DAVID T., Ph.D. (University of California at Riverside)
Assistant Professor, Entomology and Nematology

KATOVICH, MICHAEL J., Ph.D. (University of California at Davis)
Professor, Pharmacodynamics

KATRITZKY, ALAN R., Ph.D. (Cambridge University)
Kenan Professor of Organic Chemistry

KAUFMAN, MICHAEL J., Ph.D. (University of Illinois)
Associate Professor, Materials Science and Engineering

KAUFMANN, DAVID A., Ph.D. (University of Iowa)
Professor, Exercise and Sport Sciences

KAUFMANN, JOHN H., Ph.D. (University of California at Berkeley)
Professor, Zoology

KAUL, J. MIKAEL, M.Arch. (Cornell University)
Assistant Professor, Architecture

KEEGAN, WILLIAM F., Ph.D. (University of California at Los Angeles)
Associate Professor, Anthropology

KEESLING, JAMES E., Ph.D. (University of Miami)
Professor, Mathematics

KELLER-WOOD, MAUREEN P., Ph.D. (University of California at San Francisco)
Associate Professor, Physiology

KELSO, WILLIAM A., Ph.D. (University of Wisconsin)
Associate Professor, Political Science

KEM, WILLIAM R., Ph.D. (University of Illinois)
Professor, Pharmacology and Therapeutics

KEMKER, FRANCIS J., Ph.D. (University of Denver)
Professor, Communication Processes and Disorders

KEMP, HAROLD W., M.S. (University of Illinois)
Professor, Architecture

KEMPLE, KRISTEN M., Ph.D. (University of Texas)
Assistant Professor, Instruction and Curriculum

KENDALL, ROBERT L., Ph.D. (Indiana University)
Professor, Journalism and Communications

KENDER, WALTER J., Ph.D. (Rutgers State University)
Professor, Horticultural Science

KENNEDY, ROBERT T., Ph.D. (University of North Carolina at Chapel Hill)
Assistant Professor, Chemistry

KENNEDY, WILLIAM J., Ph.D. (Tulane University)
Associate Professor, Anthropology

KENNY, LAWRENCE W., Ph.D. (University of Chicago)
Professor, Economics

KENT, KURT E.M., Ph.D. (University of Minnesota)
Professor, Journalism and Communications

KEPNER, KARL W., Ph.D. (Ohio State University)
Distinguished Service Professor, Food and Resource Economics

KERSHNER, R. B., JR., Ph.D. (Stanford University)
Professor, English

KERSLAKE, KENNETH A., M.F.A. (University of Illinois)
Distinguished Service Professor, Art

KHAN, SAEED R., Ph.D. (University of Florida)
Associate Professor, Pathology and Laboratory Medicine

KHURI, ANDRE I., Ph.D. (Virginia Polytechnic Institute)
Professor, Statistics

KIBERT, CHARLES J., Ph.D. (University of South Florida)
Associate Professor, Building Construction

KIDDER, GERALD, Ph.D. (Oklahoma State University)
Professor, Soil and Water Science

KIKER, CLYDE F., Ph.D. (University of Florida)
Professor, Food and Resource Economics

KILBERG, MICHAEL S., Ph.D. (University of South Dakota)
Professor, Biochemistry and Molecular Biology

KILMER, RICHARD L., Ph.D. (Ohio State University)
Professor, Food and Resource Economics

KILTIE, RICHARD A., Ph.D. (Princeton University)
Associate Professor, Zoology

KIMBERLIN, CAROLE L., Ph.D. (University of Nebraska)
Associate Professor, Pharmacy Health Care Administration

KIMBROUGH, JAMES W., Ph.D. (Cornell University)
Professor, Plant Pathology

KING, ARTHUR D., Ph.D. (Florida State University)
Associate Professor, Instruction and Curriculum

KING, F. W., Ph.D. (University of Miami)
Professor, Zoology

KING, GREGORY, D.M.Sc. (Harvard University)
Professor, Oral Biology

KING, JONATHAN L., Ph.D. (Stanford University)
Associate Professor, Mathematics

KING, MICHAEL A., Ph.D. (University of Florida)
Assistant Professor, Neuroscience

KING, ROBERT R., D.V.M., Ph.D. (Washington State University)
Assistant Professor, Veterinary Medicine

KINZEY, BERTRAM Y., JR., M.S. (Virginia Polytechnic Institute)
Professor, Architecture

KIRKPATRICK, MARTIN S., M.A. (University of Florida)
Professor, English

KIRMSE, DALE W., Ph.D. (Iowa State University)
Associate Professor, Chemical Engineering

KISTLER, HAROLD C., Ph.D. (Cornell University)
Associate Professor, Plant Pathology

KITCHENS, WILEY M., Ph.D. (North Carolina State University)
Associate Professor, Forest Resources and Conservation

KITTS-TURNER, JOHN S., M.M. (Butler University)
Professor, Music

KLAUDER, JOHN R., Ph.D. (Princeton University)
Professor, Physics

KLAUSNER, JAMES F., Ph.D. (University of Illinois)
Assistant Professor, Mechanical Engineering

KLEIN, PAUL A., Ph.D. (University of Florida)
Professor, Pathology and Laboratory Medicine

KLINE, DANIEL L., Ph.D. (North Carolina State University)
Assistant Professor, Entomology and Nematology

KNAPP, JOSEPH L., Ph.D. (Mississippi State University)
Professor, Entomology and Nematology

KNAUFT, DAVID A., Ph.D. (Cornell University)
Professor, Agronomy

KNECHEL, W.R., Ph.D. (University of North Carolina)
Professor, Accounting

KNIGHT, MATTHEW E., M.D. (University of Iowa)
Assistant Professor, Pharmacology and Therapeutics

KNIGHT, ROBERT J., JR., Ph.D. (University of Virginia)
Professor, Horticultural Science

KNISELEY, SHERMAN P., Ph.D. (University of North Carolina)
Professor, Music

KOCH, KAREN E., Ph.D. (University of Iowa)
Professor, Horticultural Science

KOEHLER, GARY J., Ph.D. (Purdue University)
Professor, Decision and Information Sciences

KOEHLER, PHILIP G., Ph.D. (Cornell University)
Professor, Entomology and Nematology

KONE, DAISY, M.Arch. (University of Texas)
Assistant Professor, Building Construction

KOOPMAN, BEN L., Ph.D. (University of California)
Professor, Environmental Engineering Sciences

KORAN, JOHN J., JR., Ph.D. (Stanford University)
Professor, Instruction and Curriculum

KORAN, MARY L., Ph.D. (Stanford University)
Professor, Foundations of Education

KOROLY, MARY J., Ph.D. (Bryn Mawr College)
Assistant Scientist, Biochemistry and Molecular Biology

KOSCH, PHILLIP C., Ph.D. (University of California at Davis)
Professor, Veterinary Medicine

KOSCH, SHARON G., Ph.D. (University of Florida)
Professor, Psychology

KOSTEWICZ, STEPHEN R., Ph.D. (Ohio State University)
Associate Professor, Horticultural Science

KOTEY, PAUL A., Ph.D. (University of Wisconsin)
Associate Professor, Linguistics

KRAFT, HELGA W., Ph.D. (University of California at Berkeley)
Associate Professor, Germanic and Slavic Languages and Literatures

KRAFT, JOHN, Ph.D. (University of Pittsburgh)
Professor, Finance, Insurance, and Real Estate

KRAMER, JOHN L., Ph.D. (University of Michigan)
Professor, Accounting

KRAMER, SANDRA S., Ph.D. (University of Texas at Austin)
Associate Professor, Accounting

KRANZLER, JOHN H., Ph.D. (University of California at Berkeley)
Assistant Professor, Foundations of Education

KREMGOLD, DAVID A., M.F.A. (University of Iowa)
Associate Professor, Art

KRETSCHMER, ALBERT E., JR., Ph.D. (Rutgers State University)
Professor, Agronomy

KRICOS, PATRICIA B., Ph.D. (Ohio State University)
Professor, Communication Processes and Disorders

KRISCHER, JEFFREY P., Ph.D. (Harvard University)
Professor, Industrial and Systems Engineering

KUCHAREK, THOMAS A., Ph.D. (University of Minnesota)
Professor, Plant Pathology

KULDAU, JOHN M., M.D. (Case-Western Reserve University)
Professor, Psychiatry

KUMAR, AMITAVA, M.A. (Syracuse University)
Assistant Professor, English

KUMAR, PRADEEP P., Ph.D. (University of California at San Diego)
Professor, Physics

KUNKLE, GAIL A., D.V.M. (Ohio State University)
Professor, Veterinary Medicine

KUNKLE, WILLIAM E., Ph.D. (Ohio State University)
Associate Professor, Animal Science

KURZWEG, ULRICH H., Ph.D. (Princeton University)
Professor, Aerospace Engineering, Mechanics, and Engineering Science

KUSHNER, DAVID Z., Ph.D. (University of Michigan)
Professor, Music

LABISKY, RONALD F., Ph.D. (University of Wisconsin)
Professor, Forest Resources and Conservation

LA GRECA, ANTHONY J., Ph.D. (Ohio State University)
Professor, Sociology

LAINE, ANDREW F., D.Sc. (Washington University)
Assistant Professor, Computer and Information Sciences

LAIPIS, PHILIP J., Ph.D. (Stanford University)
Professor, Biochemistry and Molecular Biology

LAM, HERMAN, Ph.D. (University of Florida)
Associate Professor, Electrical Engineering

LAMKEY, JAMES W., Ph.D. (University of Nebraska)
Assistant Professor, Animal Science

LAMME, ARY J., III, Ph.D. (Syracuse University)
Associate Professor, Geography

LAMME, LINDA L., Ph.D. (Syracuse University)
Professor, Instruction and Curriculum

LANCASTER, KENT M., Ph.D. (Michigan State University)
Professor, Journalism and Communications

LANCIANI, CARMINE A., Ph.D. (Cornell University)
Professor, Zoology

LANDOLT, PETER J., Ph.D. (Washington State University)
Assistant Professor, Entomology and Nematology

LANG, PETER J., Ph.D. (University of Buffalo)
Graduate Research Professor, Clinical and Health Psychology

LANGELAND, KENNETH A., Ph.D. (University of Florida)
Associate Professor, Agronomy

LANGHAM, MAX R., Ph.D. (University of Illinois)
Professor, Food and Resource Economics

LANGLAND, ELIZABETH, Ph.D. (University of Chicago)
Professor, English

LANSING, CAROL L., Ph.D. (University of Michigan)
Associate Professor, History

LANZA-KADUCE, LONN M., Ph.D. (University of Iowa)
Associate Professor, Sociology

LANZILLOTTI, ROBERT F., Ph.D. (University of California at Berkeley)
Professor, Economics

LARKIN, LYNN H., Ph.D. (University of Colorado)
Professor, Anatomy and Cell Biology

LAROCHELLE, DIANE R., Ph.D. (University of Connecticut)
Professor, Nursing

LARSEN, ROLF E., Ph.D. (University of Minnesota)
Associate Professor, Veterinary Medicine

LARSON, JEAN A., Ph.D. (Dartmouth College)
Professor, Mathematics

LATCHMAN, HANIPH A., Ph.D. (Oxford University)
Associate Professor, Electrical Engineering

LAW, MARK E., Ph.D. (Stanford University)
Associate Professor, Electrical Engineering

LAWMAN, MICHAEL J., Ph.D. (University of Surrey)
Associate Professor, Immunology and Medical Microbiology

LAWRENCE, PAULINE O., Ph.D. (University of Florida)
Professor, Zoology

LEACOCK, ROBERT J., Ph.D. (University of Florida)
Associate Professor, Astronomy

LEADON, BERNARD M., Ph.D. (University of Minnesota)
Professor, Aerospace Engineering, Mechanics, and Engineering Science

LEAK, FRED W., Ph.D. (University of Kentucky)
Associate Professor, Animal Science

LEAR, WILLIAM E., Ph.D. (Stanford University)
Assistant Professor, Mechanical Engineering

LEAVENWORTH, RICHARD S., Ph.D. (Stanford University)
Professor, Industrial and Systems Engineering

LEAVEY, JOHN P., Ph.D. (Emory University)
Professor, English

LEBLANC, MICHELLE M., D.V.M. (Michigan State University)
Associate Professor, Veterinary Medicine

LEBO, GEORGE R., Ph.D. (University of Florida)
Associate Professor, Physics and Astronomy

LEE, CHUNG-YEE, Ph.D. (Yale University)
Associate Professor, Industrial and Systems Engineering

LEE, GARY R., Ph.D. (University of Minnesota)
Professor, Sociology

LEE, HONG H., Ph.D. (Purdue University)
Professor, Chemical Engineering

LEE, RICHARD F., Ph.D. (Kansas State University)
Professor, Plant Pathology

LEE, YANN-HANG, Ph.D. (University of Michigan)
Associate Professor, Computer and Information Sciences

LEFEBVRE, LYNN W., Ph.D. (University of Florida)
Assistant Professor, Forest Resources and Conservation

LEGG, KEITH R., Ph.D. (University of California at Berkeley)
Professor, Political Science

LEGRAND, FERDINAND, M.S. (College for Tropical Agriculture, Netherlands)
Associate Professor, Agronomy

LEIBEE, GARY L., Ph.D. (University of Kentucky)
Associate Professor, Entomology and Nematology

LEIBMAN, KENNETH C., Ph.D. (New York University)
Professor, Pharmacology and Therapeutics

LEILICH, ROY E., Re.D. (Indiana University)
Professor, Recreation, Parks and Tourism

LELE, UMA, Ph.D. (Cornell University)
Graduate Research Professor, Food and Resource Economics

LEMARCHAND, RENE, Ph.D. (University of California at Los Angeles)
Professor, Political Science

LEONARD, CHRISTIANA M., Ph.D. (Massachusetts Institute of Technology)
Professor, Neuroscience

LEONARD, THOMAS M., Ph.D. (American University)
Professor, History

LEOPOLD, A. CARL, Ph.D. (Harvard University)
Professor, Horticultural Science

LERCH, HAROLD A., Ph.D. (Ohio State University)
Professor, Exercise and Sport Sciences

LESLIE, MICHAEL, Ph.D. (University of Washington)
Assistant Professor, Journalism and Communications

LEVERENZ, DAVID, Ph.D. (University of California at Berkeley)
Professor, English

LEVEY, DOUGLAS J., Ph.D. (University of Wisconsin)
Associate Professor, Zoology

LEVY, C. MICHAEL, Ph.D. (University of Wisconsin)
Professor, Psychology

LEVY, HAIM, Ph.D. (Hebrew University)
Graduate Research Professor of Finance

LEWIN, ALFRED S., Ph.D. (University of Chicago)
Professor, Immunology and Medical Microbiology

LEWIS, ALLISON L., JR. Ph.D. (Duke University)
Professor, Philosophy

LEWIS, TRACY R., Ph.D. (University of California at San Diego)
James W. Walter Eminent Scholar in Entrepreneurship

LI, SHENG S., Ph.D. (Rice University)
Professor, Electrical Engineering

LIBBY, LAWRENCE W., Ph.D. (Cornell University)
Professor, Food and Resource Economics

LIEB, SANDI, Ph.D. (University of Kentucky)
Associate Professor, Animal Science

LIEBERMAN, LESLIE S., Ph.D. (University of Connecticut)
Associate Professor, Anthropology

LILLYWHITE, HARVEY B., Ph.D. (University of California at Los Angeles)
Professor, Zoology

LIMACHER, MARIAN C., M.D. (St. Louis University)
Associate Professor, Exercise and Sport Sciences

LINCOLN, EDWARD P., Ph.D. (University of Arizona)
Associate Professor, Agricultural Engineering

LIND, STEPHEN A., LL.M. (New York University)
Professor, Taxation

LINDBERG, WILLIAM J., Ph.D. (Florida State University)
Associate Professor, Forest Resources and Conservation

LINDGREN, ERIK R., Dr.Sc. (Royal Institute of Technology)
Professor, Aerospace Engineering, Mechanics, and Engineering Science

LINDHOLM, FRED A., Ph.D. (University of Arizona)
Professor, Electrical Engineering

LINDQUIST, ROBERT C., Ph.D. (University of Utah)
Assistant Professor, Geology

LINDSAY, JAMES A., Ph.D. (Australian National University)
Professor, Food Science and Human Nutrition

LING, DAVID C., Ph.D. (Ohio State University)
Associate Professor, Finance, Insurance, and Real Estate

LINSCOTT, LESTER L., M.L.A. (Kansas State University)
Associate Professor, Landscape Architecture

LINSER, PAUL J., Ph.D. (University of Cincinnati)
Associate Professor, Anatomy and Cell Biology

LIOU, FWU-SHIUN, Ph.D. (University of Texas)
Associate Professor, Buidling Construction

LIPOWSKI, EARLENE E., Ph.D. (University of Wisconsin)
Assistant Professor, Pharmacy Health Care Administration

LISLE, FORREST F., JR. M.Arch. (Cornell University)
Associate Professor, Architecture

LITTELL, RAMON C., Ph.D. (Oklahoma State University)
Professor, Statistics

LITTLE, JOSEPH W., J.D. (University of Michigan)
Professor, Taxation

LITZ, RICHARD E., Ph.D. (University of Nottingham)
Professor, Horticultural Science

LIVADAS, PANOS E., Ph.D. (University of Florida)
Assistant Professor, Computer and Information Sciences

LIVINGSTON, MILES B., Ph.D. (New York University)
Professor, Finance, Insurance, and Real Estate

LLOYD, JAMES E. Ph.D. (Cornell University)
Professor, Entomology and Nematology

LOCASCIO, SALVADORE, J., Ph.D. (Purdue University)
Professor, Horticultural Science

LOCKE, DAVID M., Ph.D. (University of Illinois)
Professor, English

LOCKHART, MADELYN M., Ph.D. (Ohio State University)
Professor, Economics

LOESCH, LARRY C., Ph.D. (Kent State University)
Professor, Counselor Education

LOEWER, OTTO J., Ph.D. (Purdue University)
Professor, Agricultural Engineering

LOFGREN, CLIFFORD S., Ph.D. (University of Florida)
Professor, Entomology and Nematology

LOGAN, WILLIAM, M.F.A. (University of Iowa)
Professor, English

LOMBANA, JUDY H., Ph.D. (Florida State University)
Associate Professor, Counselor Education

LOMBARDI, JOHN V., Ph.D. (Columbia University)
Professor, History

LOMBARDINO, LINDA J., Ph.D. (Ohio State University)
Professor, Communication Processes and Disorders

LOMBARDO, ANTHONY, Ph.D. (Syracuse University)
Assistant Professor, Chemistry

LONG, BURL F., Ph.D. (Pennsylvania State University)
Professor, Food and Resource Economics

LONG, GARY, Ph.D. (Texas A&M University)
Associate Professor, Civil Engineering

LOPEZ, LARRY M., Pharm.D. (University of Florida)
Professor, Pharmacy Practice

LOSANO, WAYNE A., Ph.D. (Rensselaer Polytechnic Institute)
Associate Professor, English

LOSAVIO, SAM R., M.F.A. (Louisiana State University)
Assistant Professor, Art

LOTTENBERG, RICHARD, M.D. (University of Florida)
Professor, Biochemistry and Molecular Biology

LOTZKAR, STANLEY, M.P.H. (University of Pittsburgh)
Professor, Dentistry

LOUNIBOS, LEON P., Ph.D. (Harvard University)
Professor, Entomology and Nematology

LOWDIN, PER-OLOV, Ph.D. (Uppsala University)
Graduate Research Professor, Chemistry

LOWENSTEIN, RALPH L., Ph.D. (University of Missouri)
Professor, Journalism and Communications

LOWENTHALL, DAVID T., Ph.D. (Temple University)
Professor, Exercise and Sport Sciences

LU, SUNG Y., Ph.D. (Carnegie-Mellon Institute)
Professor, Aerospace Engineering, Mechanics, and Engineering Science

LUCANSKY, TERRY W., Ph.D. (Duke University)
Associate Professor, Botany

LUDWIG, KIRK A., Ph.D. (University of California at Berkeley)
Assistant Professor, Philosophy

LUKE, HERBERT H., Ph.D. (Louisiana State University)
Professor, Plant Pathology

LUNDGREN, DALE A., Ph.D. (University of Minnesota)
Professor, Environmental Engineering Sciences

LUONI, STEPHEN D., M.Arch. (Yale University)
Assistant Professor, Architecture

LUSH, ALLEN M., Ph.D. (Massachusetts Institute of Technology)
Assistant Professor, Mechanical Engineering

LUTRICK, MONROE C., Ph.D. (Ohio State University)
Professor, Soil and Water Science

LUTTGE, WILLIAM G., Ph.D. (University of California at Irvine)
Professor, Neuroscience

LUTZ, RICHARD J., Ph.D. (University of Illinois)
Professor, Marketing

LYBAS, JOHN M., Ph.D. (University of Illinois)
Associate Professor, Civil Engineering

LYNCH, JOHN G., JR., Ph.D. (University of Illinois)
Graduate Research Professor, Marketing

LYNNE, GARY D., Ph.D. (Oregon State University)
Professor, Food and Resource Economics

LYON, EUGENE, Ph.D. (University of Florida)
Associate Professor, History

LYRENE, PAUL M., Ph.D. (University of Wisconsin)
Professor, Horticultural Science

MACFADDEN, BRUCE J., Ph.D. (Columbia University)
Professor, Zoology

MACKAY, ROBERT, Ph.D. (University of Florida)
Associate Professor, Veterinary Medicine

MACKENZIE, RICHARD S., Ph.D. (University of Pittsburgh)
Professor, Instruction and Curriculum

MACLAREN, NOEL K., M.D. (Otago University)
Professor, Pathology and Laboratory Medicine

MACLENNAN, ALEXANDER J., Ph.D. (University of British Columbia)
Assistant Professor, Neuroscience

MACLEOD, MURDO J., Ph.D. (University of Florida)
Graduate Research Professor, History

MACLEOD, ROBERT M., M.Arch. (Harvard University)
Assistant Professor Architecture

MADDALA, G. S., Ph.D. (University of Chicago)
Graduate Research Professor, Economics

MADISON, JOHN B., V.M.D. (University of Pennsylvania)
Assistant Professor, Veterinary Medicine

MADSEN, KIRSTEN M., M.D. (University of Aarhus)
Associate Professor, Anatomy and Cell Science

MAGNARELLA, PAUL J., J.D. (University of Florida) **Ph.D.** (Harvard University)
Professor, Anthropology

MAGNUSSON, N. INGVAR, D.D.S. (University of Lund)
Professor, Oral Biology

MAHAN, CHARLES S., M.D. (Northwestern University)
Professor, Obstetrics and Gynecology

MAHAN, PARKER E., Ph.D. (University of Rochester)
Distinguished Service Professor, Oral Biology

MAHLIOS, MARC C., Ph.D. (Arizona State University)
Professor, Instruction and Curriculum

MAHONEY, JOHN F., Ph.D. (Lehigh University)
Professor, Industrial and Systems Engineering

MAIR, BERNARD A., Ph.D. (McGill University)
Associate Professor, Mathematics

MAJTHAY, ANTAL, Ph.D. (University of Szeged)
Associate Professor, Decision and Information Sciences

MALAGODI, EDWARD F., JR., Ph.D. (University of Miami)
Professor, Psychology

MALASANOS, LOIS J., Ph.D. (University of Illinois)
Professor, Nursing

MALECKI, EDWARD J., Ph.D. (Ohio State University)
Professor, Geography

MALLEN, ENRIQUE, Ph.D. (Cornell University)
Assistant Professor, Romance Languages and Literatures

MALVERN, LAWRENCE E., Ph.D. (Brown University)
Professor, Aerospace Engineering, Mechanics, and Engineering Science

MAMARCHEV, HELEN L., Ph.D. (University of Michigan)
Asisstant Professor, Counselor Education

MANCHESTER, STEVEN R., Ph.D. (Indiana University)
Assistant Professor, Botany

MANSELL, ROBERT S., Ph.D. (Iowa State University)
Professor, Soil and Water Science

MANTRALA, MURALI, Ph.D. (Northwestern University)
Assistant Professor, Marketing

MAPLES, WILLIAM R., Ph.D. (University of Texas at Austin)
Professor, Anthropology

MARCUS, ROBERT B., Ed.D. (University of Florida)
Professor, Geography

MARECI, THOMAS, Ph.D. (Oxford University)
Associate Professor, Physics

MAREN, THOMAS H., M.D. (Johns Hopkins University)
Graduate Research Professor, Pharmacology and Therapeutics

MARGOLIS, MAXINE L., Ph.D. (Columbia University)
Professor, Anthropology

MARIA, BERNARD, M.D. (University of Sherbrooke)
Associate Professor, Neuroscience

MARIOTTI, ANGELO J., Ph.D. (West Virginia University)
Associate Professor, Pharmacology and Therapeutics

MARKEL, NORMAN N., Ph.D. (University of Chicago)
Professor, Communication Processes and Disorders

MARKS, RONALD G., Ph.D. (University of Florida)
Professor, Statistics

MARQUANT, WILLIAM H., Ph.D. (Washington University)
Professor, Anthropology

MARSHALL, MAURICE R., Ph.D. (Ohio State University)
Professor, Food Science and Human Nutrition

MARSHALL, MELODY J., Ph.D. (University of Oklahoma)
Associate Professor, Nursing

MARSHALL, TIMOTHY T., Ph.D. (University of Florida)
Associate Professor, Animal Science

MARSIGLIO, WILLIAM, Ph.D. (Ohio State University)
Associate Professor, Sociology

MARSTON, ROBERT Q., M.D. (Medical College of Virginia)
President Emeritus and Professor Emeritus, Forest Resources and Conservation

MARTIN, ANATOLE D., Ph.D. (University of Tennessee)
Associate Professor, Physical Therapy

MARTIN, FRANK G., Ph.D. (North Carolina State University)
Professor, Statistics

MARTIN, FRANK N., Ph.D. (University of California at Berkeley)
Associate Professor, Plant Pathology

MARTIN, SHIRLEY D., Ph.D. (University of Florida)
Professor, Nursing

MARTINEZ, JORGE, Ph.D. (Tulane University)
Professor, Mathematics

MARTINEZ, MICHAEL D., Ph.D. (University of Michigan)
Associate Professor, Political Science

MARTSOLF, J. DAVID, Ph.D. (University of Missouri)
Professor, Horticultural Science

MARUNIAK, JAMES E., Ph.D. (University of Texas at Austin)
Associate Professor, Entomology and Nematology

MASON, JOHN E., Ph.D. (Yale University)
Assistant Professor, History

MATAGA, PETER A., Ph.D. (Harvard University)
Assistant Professor, Aerospace Engineering, Mechanics, and Engineering Science

MATHENY, ALBERT R., III, Ph.D. (University of Minnesota)
Associate Professor, Political Science

MATHER, FLOYD B., Ph.D. (University of California at Davis)
Associate Professor, Poultry Science

MATTHEW, GARY K., Ph.D. (University of Florida)
Associate Professor, Mechanical Engineering

MATTHEWS, RICHARD F., Ph.D. (Cornell University)
Professor, Food Science and Human Nutrition

MATURO, FRANK J., JR., Ph.D. (Duke University)
Professor, Zoology

MAUDERLI, WALTER, D.Sc. (University of Zurich)
Professor, Environmental Engineering Sciences

MAURER, VIRGINIA G., J.D. (Stanford University)
Professor, Business Administration

MAY, FRANK P., Ph.D. (University of Florida)
Professor, Chemical Engineering

MAYER, MARION S., Ph.D. (Texas A&M University)
Associate Professor, Entomology and Nematology

MAYNARD, DONALD N., Ph.D. (University of Massachusetts)
Professor, Horticultural Science

MAZZOTTI, FRANK J., Ph.D. (Pennsylvania State University)
Assistant Extension Scientist, Forest Resources and Conservation

MCALISTER, LYLE N., Ph.D. (University of California at Berkeley)
Distinguished Service Professor, History

MCARTHUR, WILLIAM P., Ph.D. (Purdue University)
Professor, Oral Biology

MCAUSLANE, HEATHER J., Ph.D. (Texas A&M University)
Assistant Professor, Entomology and Nematology

MCCALL, GAIL E., Re.D. (Indiana University)
Associate Professor, Recreation, Parks, and Tourism

MCCARTER, ROBERT S., M.Arch. (Columbia University)
Professor, Architecture

MCCARTHY, KEVIN, M., Ph.D. (University of North Carolina)
Professor, English

MCCARTY, DONALD R., Ph.D. (University of Wisconsin)
Associate Professor, Horticultural Science

MCCARTY, LAMBERT B., Ph.D. (University of Wisconsin)
Associate Professor, Horticultural Science

MCCLELLAN, GUERRY H., Ph.D. (University of Illinois)
Professor, Geology

MCCOLLOUGH, W. ANDREW, Ph.D. (University of Florida)
Professor, Finance, Insurance, and Real Estate

MCCONNELL, DENNIS B., Ph.D. (University of Wisconsin)
Professor, Horticulture Science

MCCORD, EDWARD A., Ph.D. (University of Michigan)
Assistant Professor, History

MCCORMACK, WAYNE T., Ph.D. (Florida State University)
Assistant Professor, Pathology and Laboratory Medicine

MCCOY, CLAYTON W., JR., Ph.D. (University of California at Riverside)
Professor, Entomology and Nematology

MCCOY, TERRY L., Ph.D. (University of Wisconsin)
Professor, Latin American Studies

MCCREA, BRIAN R., Ph.D. (University of Virginia)
Professor, English

MCCULLOUGH, SCOTT, Ph.D. (University of California at San Diego)
Assistant Professor, Mathematics

MCDONALD, CHARLES L., Ph.D. (Michigan State University)
Associate Professor, Accounting

MCDOWELL, LEE, Ph.D. (Washington State University)
Professor, Animal Science

MCEDWARD, LARRY R., Ph.D. (University of Washington)
Assistant Professor, Zoology

MCGHEE, MAXIE B., Ph.D. (Ohio State University)
Professor, Agricultural Education and Communication

MCGILL, GARY A., Ph.D. (Texas Technical University)
Assistant Professor, Accounting

MCGOVERN, ROBERT J., Ph.D. (Cornell University)
Assistant Professor, Plant Pathology

MCGUIGAN, JAMES E., M.D. (St. Louis University)
Professor, Immunology and Medical Microbiology

MCGUIRE, PETER M., Ph.D. (University of North Carolina)
Assistant Professor, Biochemistry and Molecular Biology

MCIVOR, CAROLE C., Ph.D. (University of Virginia)
Assistant Professor, Forest Resources and Conservation

MCKEEN, WILLIAM L., Ph.D. (University of Oklahoma)
Associate Professor, Journalism and Communications

MCKENZIE, MICHAEL W., Ph.D. (Purdue University)
Professor, Pharmacy Practice

MCKNIGHT, STEPHEN A., Ph.D. (Emory University)
Professor, History

MCLAUGHLIN, JOHN R., Ph.D. (University of California at Berkeley)
Assistant Professor, Entomology and Nematology

MCMAHON, ROBERT J., Ph.D. (University of Connecticut)
Professor, History

MCMANUS, ELAINE M., Ph.D. (University of Texas)
Associate Professor, Nursing

MCMILLAN, ROBERT T., JR., Ph.D. (Washington State University)
Associate Professor, Plant Pathology

MCMILLIN, MARVIN R., Ed.D. (University of Florida)
Associate Professor, Counselor Education

MCNAB, BRIAN K., Ph.D. (University of Wisconsin)
Professor, Zoology

MCNEAL, BRIAN L., Ph.D. (University of California at Riverside)
Professor, Soil and Water Science

MCRITCHIE, JOHN J., Ph.D. (Ohio State University)
Assistant Professor, Plant Pathology

MCSORLEY, ROBERT, Ph.D. (Purdue University)
Professor, Entomology and Nematology

MCVAY, MICHAEL C., Ph.D. (University of Massachusetts)
Associate Professor, Civil Engineering

MEALIEA, WALLACE L., JR., Ph.D.(University of Missouri)
Professor, Clinical and Health Psychology

MECHOLSKY, JOHN J., Ph.D. (Catholic University of America)
Professor, Materials Science and Engineering

MEEK, PHYLLIS M., Ed.D. (University of Florida)
Associate Professor, Counselor Education

MEEROW, ALAN W., Ph.D. (University of Florida)
Associate Professor, Horticultural Science

MEHTA, ASHISH J., Ph.D. (University of Florida)
Professor, Coastal and Oceanographic Engineering

MEI, RENWEI, Ph.D. (University of Illinois)
Assistant Professor, Aerospace Engineering, Mechanics, and Engineering Science

MEISEL, MARK W., Ph.D. (Northwestern University)
Associate Professor, Physics

MELDRUM, MICHAEL J., Ph.D. (Ohio State University)
Associate Professor, Pharmacodynamics

MELTZER, MARTIN J., Ph.D. (Cornell University)
Assistant Scientist, Veterinary Medicine

MENDENHALL, WILLIAM M., M.D. (University of South Florida)
Associate Professor, Radiation Therapy

MERCER, CECIL D., Ed.D. (University of Virginia)
Professor, Special Education

MERRITT, ALFRED M., D.V.M. (Cornell University)
Professor, Veterinary Medicine—IFAS

MERRITT, HARRY C., JR., M.S. (Harvard University)
Professor, Architecture

MESSIER, WILLIAM F., D.B.A. (Indiana University)
Professor, Accounting

MEYER, EDWIN M., Ph.D. (Massachusetts Institute of Technology)
Associate Professor, Pharmacology and Therapeutics

MEYER, MERLE E., Ph.D. (University of Washington)
Professor, Psychology

MICHA, DAVID A., Ph.D. (Uppsala University)
Professor, Chemistry

MICK, DAVID G., Ph.D. (Indiana University)
Assistant Professor, Marketing

MICKLOW, GERALD J., Ph.D. (Virginia Polytechnic Institute)
Assistant Professor, Mechanical Engineering

MIDDLEBROOKS, JOHN C., Ph.D. (University of California at San Francisco)
Associate Professor, Neuroscience

MIKOLAITIS, DAVID W., Ph.D. (University of Illinois)
Associate Professor, Aerospace Engineering, Mechanics, and Engineering Science

MILANICH, JERALD T., Ph.D. (University of Florida)
Professor, Anthropology

MILBRATH, SUSAN, Ph.D. (Columbia University)
Associate Professor, Latin American Studies

MILES, RICHARD D., Ph.D. (Purdue University)
Professor, Poultry Science

MILLARD, WILLIAM, Ph.D. (University of Toledo)
Associate Professor, Pharmacodynamics

MILLER, CLEVE D., LL.M. (New York University)
Professor, Taxation

MILLER, D. GARY, Ph.D. (Harvard University)
Associate Professor, Linguistics

MILLER, GARY J., Ph.D. (University of Florida)
Associate Professor, Mechanical Engineering

MILLER, JIMMY D., Ph.D. (Auburn University)
Assistant Professor, Agronomy

MILLER, JOHN W., Ph.D. (University of Florida)
Associate Professor, Plant Pathology

MILLER, M. DAVID, Ph.D. (University of California at Los Angeles)
Associate Professor, Foundations of Education

MILLER, MICHAEL K., Ph.D. (Pennsylvania State University)
Professor, Sociology

MILLER, PATRICIA H., Ph.D. (University of Minnesota)
Professor, Psychology

MILLER, ROSALIE, Ph.D. (University of Florida)
Associate Professor, Occupational Therapy

MILLER, SCOTT A., Ph.D. (University of Minnesota)
Professor, Psychology

MILLER, SCOTT L., Ph.D. (University of California at San Diego)
Assistant Professor, Electrical Engineering

MILLER, THOMAS, Ph.D. (North Carolina State University)
Professor, Forest Resources and Conservation

MILLER, W. LAMAR, Ph.D. (University of Florida)
Professor, Environmental Engineering Sciences

MILLER, WILLIAM M., Ph.D. (Pennsylvania State University)
Professor, Agricultural Engineering

MILON, JOSEPH W., Ph.D. (Florida State University)
Professor, Food and Resource Economics

MILTON, JAMES E., Ph.D. (University of Florida)
Engineer, Aerospace Engineering, Mechanics, and Engineering Science

MISHOE, J. WAYNE, Ph.D. (North Carolina State University)
Professor, Agricultural Engineering

MISLEVY, PAUL, Ph.D. (Pennsylvania State University)
Professor, Agronomy

MITCHELL, DAVID J., Ph.D. (University of California at Berkeley)
Professor, Plant Pathology

MITCHELL, EVERETT R., Ph.D. (North Carolina State University)
Professor, Entomology and Nematology

MITCHELL, WILLIAM, Ph.D. (University of California at Berkeley)
Professor, Mathematics

MIYAMOTO, MICHAEL M., Ph.D. (University of Southern California)
Associate Professor, Zoology

MIZELL, RUSSELL F., Ph.D. (Mississippi State University)
Professor, Entomology and Nematology

MOHAMMAD, MOHAMMAD A., Ph.D. (University of Southern California)
Assistant Professor, Linguistics

MONKHORST, HENDRICK J., Ph.D. (University of Groningen)
Professor, Physics

MONTAGUE, CLAY L., Ph.D. (University of Georgia)
Associate Professor, Environmental Engineering Sciences

MOORADIAN, ROBERT M., Ph.D. (University of Pennsylvania)
Assistant Professor, Finance, Insurance, and Real Estate

MOORE, GLORIA A., Ph.D. (University of Kentucky)
Professor, Horticultural Science

MOORE, JOHN E., Ph.D. (Ohio State University)
Professor, Animal Science

MOORE, THERAL O., Ph.D. (University of Missouri)
Associate Professor, Mathematics

MORELAND, ALVIN F., D.V.M. (University of Georgia)
Professor, Veterinary Medicine

MORGAN, CHARLES F., M.Arch. (University of California at Los Angeles)
Associate Professor, Architecture

MORGAN, JAMES I., Ed.D. (University of Florida)
Professor, Psychology

MORGAN, PHILLIP B., Ph.D. (Kansas State University)
Professor, Entomology and Nematology

MORRIS, JON D., Ph.D. (University of Florida)
Associate Professor, Journalism and Communications

MORRIS, PAMELA J., Ph.D. (Michigan State University)
Assistant Professor, Soil and Water Science

MORRISON, JAMES F., Ph.D. (Stanford University)
Associate Professor, Political Science

MORTENSEN, JOHN A., Ph.D. (Cornell University)
Professor, Horticultural Science

MOSELEY, MICHAEL E., Ph.D. (Harvard University)
Professor, Anthropology

MOSS, CHARLES B., Ph.D. (Purdue University)
Associate Professor, Food and Resource Economics

MOSSA, JOANN, Ph.D. (Louisiana State University)
Assistant Professor, Geography

MOTOWIDLO, STEPHAN J., Ph.D. (University of Minnesota)
Associate Professor, Management

MOTTO, ANNA L., Ph.D. (University of North Carolina at Chapel Hill)
Professor, Classics

MOTZ, LOUIS H., Ph.D. (Vanderbilt University)
Associate Professor, Civil Engineering

MOUDGIL, BRIJ M., Sc.D. (Columbia University)
Professor, Materials Science and Engineering

MOYE, HUGH A., Ph.D. (University of Florida)
Professor, Food Science and Human Nutrition

MOYER, RICHARD W., Ph.D. (University of California at Los Angeles)
Professor, Immunology and Medical Microbiology

MOYER, SUE ANNE, Ph.D. (Columbia University)
Professor, Biochemistry and Molecular Biology

MUELLER, JAMES R., Ph.D. (Duke University)
Assistant Professor, Religion

MUELLER, PAUL A., Ph.D. (Rice University)
Professor, Geology

MUELLER, ROBERT, C., M.F.A. (Arizona State University)
Assistant Professor, Art

MUGA, MARVIN L., Ph.D. (University of Texas at Austin)
Professor, Chemistry

MUIR, DAVE F., Ph.D. (Mount Sinai School of Medicine)
Assistant Professor, Neuroscience

MULKEY, W. DAVID, Ph.D. (Clemson University)
Professor, Food and Resource Economics

MULLAHEY, JOHN J., Ph.D. (University of Nebraska)
Assistant Professor, Forest Resources and Conservation

MULLALLY, LEE J., Ph.D. (Michigan State University)
Associate Professor, Instruction and Curriculum

MULLINS, JOHN T., Ph.D. (University of North Carolina)
Professor, Botany

MUNSON, JOHN B., Ph.D. (University of Rochester)
Professor, Neuroscience

MURCHEK, JOHN B., Ph.D. (Brown University)
Assistant Professor, English

MURPHEY, MILLEDGE, Ph.D. (University of Florida)
Associate Professor, Exercise and Sport Sciences

MURPHY, CAROL J., Ph.D. (University of Pennsylvania)
Associate Professor, Romance Languages and Literatures

MURRAY, GERALD F., Ph.D. (University of Oregon)
Associate Professor, Anthropology

MUTH, EGINHARD J., Ph.D. (Polytechnic Institute of Brooklyn)
Professor, Industrial and Systems Engineering

MUTHER, THOMAS F., Ph.D. (Leeds University)
Associate Professor, Pharmacology and Therapeutics

MUTTALIB, KHANOKER A. Ph.D. (Princeton University)
Associate Professor, Physics

MYER, ROBERT O., Ph.D. (Washington State University)
Associate Professor, Animal Science

MYERS, GARDINER H., Ph.D. (University of California at Berkeley)
Associate Professor, Chemistry

MYERS, RONALD L., Ph.D. (University of Florida)
Assistant Professor, Botany

MYHRE, DONALD L., Ph.D. (University of Wisconsin)
Professor, Soil and Water Science

MYRICK, ROBERT D., Ph.D. (Arizona State University)
Professor, Counselor Education

NADEAU, STEPHAN E., M.D. (University of Florida)
Associate Professor, Neuroscience

NADKARNI, NALINI M., Ph.D. (University of Washington)
Associate Professor, Botany

NAGATA, RUSSELL T., Ph.D. (University of Florida)
Associate Professor, Horticultural Science

NAGLER, STEPHEN E., Ph.D. (University of Toronto)
Professor, Physics

NAIR, RAMACHANDRAN P., Ph.D. (Patna University)
Professor, Forest Resources and Conservation

NAJAFI, FAZIL T., Ph.D. (Virginia Polytechnic Institute)
Associate Professor, Civil Engineering

NANJI, AZIM A., Ph.D. (McGill University)
Professor, Religion

NARAYANAN, RANGANATHA, Ph.D. (Illinois Institute of Technology)
Professor, Chemical Engineering

NARAYANAN, VASUDHA R., Ph.D. (University of Bombay)
Professor, Religion

NATION, JAMES L., Ph.D. (Cornell University)
Professor, Entomology and Nematology

NATZKE, ROGER P., Ph.D. (University of Wisconsin)
Professor, Dairy Science

NAYAR, JAI K., Ph.D. (University of Illinois)
Professor, Entomology and Nematology

NEARY, DANIEL G., Ph.D. (Michigan State University)
Associate Professor, Soil and Water Science

NEEDELL, JEFFREY D., Ph.D. (Stanford University)
Associate Professor, History

NEHILEY, JAMES M., Ph.D. (Florida State University)
Associate Professor, Agricultural Education and Communication

NEILSON, JOHN T., Ph.D. (University of Glasgow)
Professor, Immunology and Medical Microbiology and Veterinary Medicine

NEIMEYER, GREG J., Ph.D. (University of Notre Dame)
Professor, Psychology

NEIMS, ALLEN H., M.D. (Johns Hopkins University)
Professor, Pharmacology and Therapeutics

NELL, TERRIL A., Ph.D. (Michigan State University)
Professor, Horticultural Science

NELMS, BEN F., Ph.D. (University of Iowa)
Professor, Instruction and Curriculum

NELSON, CHARLES W., Ph.D. (University of Maryland)
Professor, Mathematics

NELSON, MARIE, Ph.D. (University of Oregon)
Professor, English

NEUGROSCHEL, ARNOST, Ph.D. (Technion Israel Institute of Technology)
Professor, Electrical Engineering

NEVILL, DOROTHY D., Ph.D. (University of Florida)
Professor, Psychology

NEVILL, GALE E., JR., Ph.D. (Stanford University)
Professor, Aerospace Engineering, Mechanics, and Engineering Science

NEW, MELVYN, Ph.D. (Vanderbilt University)
Professor, English

NEWELL, JOHN M., Ph.D. (University of Texas at Austin)
Professor, Foundations of Education

NEWMAN, ARTHUR J., Ed.D. (Indiana University)
Professor, Foundations of Education

NEWMAN-WOLFE, RICHARD E., Ph.D. (University of Rochester)
Assistant Professor, Computer and Information Sciences

NGO, KHAI D., Ph.D. (California Institute of Technology)
Associate Professor, Electrical Engineering

NGUYEN, RU, Ph.D. (University of Florida)
Assistant Professor, Entomology and Nematology

NIBLETT, CHARLES L., Ph.D. (University of California at Riverside)
Professor, Plant Pathology

NICHELSON, JACK C., M.F.A. (Indiana University)
Professor, Art

NICHOLAS, JAMES C., Ph.D. (University of Illinois)
Professor, Urban and Regional Planning

NICHOLS, GERALDINE C., Ph.D. (Johns Hopkins University)
Professor, Romance Languages and Literatures

NICHOLLS, ROBERT D., D.Phil. (Oxford University)
Assistant Professor, Neuroscience

NICHOLS, WILMER W., Ph.D. (University of Alabama)
Associate Professor, Physiology

NICK, HARRY S., Ph.D. (University of Pennsylvania)
Associate Professor, Biochemistry and Molecular Biology

NICKENS, JOHN M., Ph.D. (Florida State University)
Professor, Educational Leadership

NICOLETTI, PAUL L., D.V.M. (University of Missouri)
Professor, Veterinary Medicine

NIGG, HERBERT N., Ph.D. (University of Illinois)
Professor, Entomology and Nematology

NIMALENDRAM, MAHENDRARAJAH, Ph.D. (University of Michigan)
Assistant Professor, Finance, Insurance, and Real Estate

NISHIDA, TOSHIKAZU, Ph.D. (University of Illinois)
Associate Professor, Electrical Engineering

NKEDI-KIZZA, PETER, Ph.D. (University of California at Davis)
Associate Professor, Soil and Water Science

NOLING, JOSEPH W., Ph.D. (University of California at Riverside)
Associate Professor, Entomology and Nematology

NOONAN, JOHN B., Ph.D. (Columbia University)
Associate Professor, Classics

NORCINI, JEFFREY G., Ph.D. (Pennsylvania State University)
Associate Professor, Horticultural Science

NORDLIE, FRANK G., Ph.D. (University of Minnesota)
Professor, Zoology

NORDSTEDT, ROGER A., Ph.D. (Ohio State University)
Professor, Agricultural Engineering

NORMANN, SIGURD J., Ph.D. (University of Washington)
Professor, Pathology and Laboratory Medicine

NUNNERY, MICHAEL Y., Ed.D. (University of Tennessee)
Professor, Educational Leadership

NYE, DAVID J., Ph.D. (University of Pennsylvania)
Professor, Finance, Insurance, and Real Estate

NYGREN, SCOTT, Ph.D. (State University of New York at Buffalo)
Associate Professor, English

OBANNON, JOHN H., Ph.D. (University of Arizona)
Professor, Entomology and Nematology

OBERLANDER, HERBERT, Ph.D. (Case Western Reserve University)
Professor, Entomology and Nematology

OBERLIN, LYNN C., Ed.D. (Michigan State University)
Professor, Instruction and Curriculum

OBERST, MICHAEL A., J.D. (University of Florida)
Professor, Taxation

O'BRIEN, DANIEL J., Ph.D. (University of Florida)
Assistant Professor, Nursing

O'BRIEN, RALPH G., Ph.D. (University of North Carolina)
Associate Professor, Statistics

O'BRIEN, THOMAS W., Ph.D. (Marquette University)
Professor, Biochemistry and Molecular Biology

OCHI, MICHAEL K., Ph.D. (American University)
Professor, Coastal and Oceanographic Engineering

O'CONNOR,GEORGE A., Ph.D. (Colorado State University)
Professor, Soil and Water Science

O'CONNOR, JOHN A., M.A. (University of California at Berkeley)
Professor, Art

ODOM, LESLIE S., Ph.D. (Eastman School of Music)
Assistant Professor, Music

ODUM, HOWARD T., Ph.D. (Yale University)
Graduate Research Professor, Environmental Engineering Sciences

O'HAIR, STEPHEN K., Ph.D. (Texas A&M University)
Associate Professor, Horticultural Science

OHANIAN, MIHRAN, J., Ph.D. (Rensselaer Polytechnic Institute)
Professor, Nuclear Engineering Sciences

OHRN, NILS Y., Ph.D. (Uppsala University)
Professor, Chemistry

OLEXA, MICHAEL T., Ph.D. (University of Florida)
Associate Professor, Food and Resource Economics

OLIVA, GIACOMO M., Ed.D. (New York University)
Professor, Music

OLIVER, CALVIN C., Ph.D. (Purdue University)
Professor, Mechanical Engineering

OLIVER, JOHN P., Ph.D. (University of California at Los Angeles)
Associate Professor, Astronomy

OLIVER SMITH, ANTHONY R., Ph.D. (Indiana University)
Professor, Anthropology

OLLER, KIMBROUGH D., Ph.D. (University of Texas at Austin)
Assistant Professor, Communication Processes and Disorders

OLSON, STEPHEN M., Ph.D. (Clemson University)
Associate Professor, Horticultural Science

OLSON, TIMOTHY A., M.S. (Iowa State University)
Associate Professor, Animal Science

OLSSON, CARL N., Ph.D. (University of Florida)
Associate Professor, Geography

O'MALLEY, JOHN R., Ph.D. (University of Florida)
Professor, Electrical Engineering

OPDYKE, NEIL D., Ph.D. (Kings College)
Professor, Geology

OPPENHEIM, PAUL, Ph.D. (University of Maryland)
Associate Professor, Building Construction

ORAZEM, MARK E., Ph.D. (University of California at Berkeley)
Professor, Chemical Engineering

ORBAN, BARBARA L., Ph.D. (University of California at Los Angeles)
Associate Professor, Health Services Administration

OSBORNE, LANCE S., Ph.D. (University of California at Davis)
Associate Professor, Entomology and Nematology

O'SHEA, THOMAS J., Ph.D. (Northern Arizona University)
Assistant Professor, Forest Resources and Conservation

OSTROFF, DAVID H., Ph.D. (Ohio University)
Professor, Journalism and Communications

OTIS, ARTHUR B., Ph.D. (Brown University)
Professor, Physiology

OTT, EDGAR A., Ph.D. (Purdue University)
Professor, Animal Science

OTWELL, WALTER S., Ph.D. (North Carolina State University)
Professor, Food Science and Human Nutrition

OU, LI-TSE, Ph.D. (University of Rochester)
Associate Scientist, Soil and Water Science

OUART, MICHAEL D., Ph.D. (Kansas State University)
Associate Professor, Poultry Science

OVERMAN, ALLEN R., Ph.D. (North Carolina State University)
Professor, Agricultural Engineering

OWEN, DENNIS E., Ph.D. (Princeton University)
Assistant Professor, Religion

PACINI-HERNANDEZ, DEBORAH, Ph.D. (Cornell University)
Assistant Professor, Latin American Studies

PACKER, ATHOL B., Ph.D. (University of Kansas)
Associate Professor, Instruction and Curriculum

PACTOR, HOWARD S., Ph.D. (University of Tennessee)
Associate Professor, Journalism and Communications

PADDY, MICHAEL R., Ph.D. (University of Oregon)
Assistant Professor, Anatomy and Cell Biology

PADEN, J. MICHAEL, Ph.D. (Indiana University)
Assistant Professor, Romance Languages and Literatures

PALENIK, GUS, Ph.D. (University of Southern California)
Professor, Chemistry

PAREDES, JAMES A., Ph.D. (University of New Mexico)
Professor, Anthropology

PARIS, BERNARD J., Ph.D. (Johns Hopkins University)
Professor, English

PARISH, MICKEY E., Ph.D. (North Carolina State University)
Associate Professor, Food Science and Human Nutrition

PARK, CHANG-WON, Ph.D. (Stanford University)
Associate Professor, Chemical Engineering

PARK, ROBERT M., Ph.D. (Glascow University)
Professor, Materials Science and Engineering

PARKANYI, CYRIL, Ph.D. (Czechoslovakia Academy of Sciences)
Professor, Chemistry

PARKER, WOODROE M., Ph.D. (University of Florida)
Professor, Counselor Education

PARSONS, LAWRENCE R., Ph.D. (Duke University)
Professor, Horticultural Science

PARTHENIADES, EMMANUEL, Ph.D. (University of California at Berkeley)
Professor, Aerospace Engineering, Mechanics, and Engineering Science

PATE, FINDLAY M., Ph.D. (University of Georgia)
Professor, Animal Science

PATRAY, JOANN H., Ph.D. (University of Florida)
Professor, Nursing

PATTERSON, RICHARD S., Ph.D. (Cornell University)
Professor, Entomology and Nematology

PAUL, HARRY W., Ph.D. (Columbia University)
Professor, History

PAULUS, DAVID A., M.D. (University of Vermont)
Professor, Mechanical Engineering

PEART, ROBERT M., Ph.D. (Purdue University)
Graduate Research Professor, Agricultural Engineering

PECK, AMMON B., Ph.D. (University of Wisconsin)
Professor, Pathology and Laboratory Medicine

PEEBLES, PEYTON Z., JR., Ph.D. (University of Pennsylvania)
Professor, Electrical Engineering

PENA, JORGE E., Ph.D. (University of Florida)
Associate Professor, Entomology and Nematology

PENDER, THOMAS M., Ph.D. (University of Georgia)
Assistant Professor, Theatre

PENDERGAST, JANE F., Ph.D. (University of Iowa)
Associate Scientist, Statistics

PENDERGAST, MARK O., Ph.D. (University of Arizona)
Assistant Professor, Decision and Information Sciences

PENLAND, ARNOLD C., JR., Ph.D. (Florida State University)
Professor, Music

PENNYPACKER, HENRY S., JR., Ph.D. (Duke University)
Professor, Psychology

PEPINE, CARL J., M.D. (New Jersey College of Medicine)
Professor, Medicine

PERCIVAL, HENRY F., Ph.D. (Clemson University)
Associate Professor, Forest Resources and Conservation

PERCIVAL, SUSAN S., Ph.D. (University of Texas at Austin)
Assistant Professor, Food Science and Human Nutrition

PERFIT, MICHAEL R., Ph.D. (Columbia University)
Professor, Geology

PERIS, JOANNA N., Ph.D. (University of Portland)
Assistant Professor, Pharmacy

PERLETTE, JOHN M., Ph.D. (University of Chicago)
Associate Professor, English

PERRI, MICHAEL G., Ph.D. (University of Missouri)
Professor, Clinical and Health Psychology

PERRIN, JOHN H., Ph.D. (University of Paris)
Professor, Medicinal Chemistry

PERRONE, CHARLES A., Ph.D. (University of Texas at Austin)
Associate Professor, Romance Languages and Literatures

PERRY, NATHAN W., JR., Ph.D. (Florida State University)
Professor, Clinical and Health Psychology

PERSON, WILLIS B., Ph.D. (University of California at Berkeley)
Professor, Chemistry

PERUMAREDDI, JAYARAMA R., Ph.D. (University of Southern California)
Professor, Chemistry

PESKOWITZ, MIRIAM B., Ph.D. (Duke University)
Assistant Professor, Religion

PETERSON, ANNA L., Ph.D. (University of Chicago)
Assistant Professor, Religion

PETERSON, JILL E., Ph.D. (Rice University)
Assistant Professor, Mechanical Engineering

PETERSON, LENNART R., Ph.D. (Massachusetts Institute of Technology)
Professor, Physics

PEVONKA, M. P., M.S.P. (University of Florida)
Professor, Pharmacy Practice

PFAHLER, PAUL L., Ph.D. (Purdue University)
Professor, Agronomy

PHARIES, DAVID A., Ph.D. (University of California at Berkeley)
Professor, Romance Languages and Literatures

PHILLIPS, M. IAN, Ph.D. (University of Birmingham)
Professor, Physiology

PHILLIPS, WINFRED M., D.Sc. (University of Virginia)
Professor, Mechanical Engineering

PHLIPS, EDWARD J., Ph.D. (University of Miami)
Assistant Professor, Forest Resources and Conservation

PICKARD, JOHN B., Ph.D. (University of Wisconsin)
Professor, English

PIERCE, FRANK N., Ph.D. (University of Illinois)
Professor, Journalism and Communications

PIERCE, ROBERT N., Ph.D. (University of Minnesota)
Professor, Journalism and Communications

PIGG, R. MORGAN, D.H.S. (Indiana University)
Professor, Health Science Education

PIRKLE, EARL C., Ph.D. (University of Cincinnati)
Professor, Geology

PISANI, JOSEPH R., Ph.D. (University of Maryland)
Professor, Journalism and Communications

PITMAN, WILLIAM D., Ph.D. (Texas A&M University)
Associate Professor, Agronomy

PITTS, JAMES H., Ph.D. (University of Northern Colorado)
Assistant Professor, Counselor Education

PLEASANTS, JULIAN M., Ph.D. (University of North Carolina)
Associate Professor, History

PLOETZ, RANDY C., Ph.D. (University of Florida)
Associate Professor, Plant Pathology

PLUTZKY, MAX, M.D. (University of Havana)
Professor, Psychiatry

POHL, MARY E., Ph.D. (Harvard University)
Associate Professor, Anthropology

POHLMAN, RICHARD W., M.Arch. (Cornell University)
Associate Professor, Architecture

POHRONEZNY, KENNETH L., Ph.D. (Ohio State University)
Professor, Plant Pathology

POLLOCK, MICHAEL L., Ph.D. (University of Illinois)
Professor, Exercise and Sport Sciences

POLOPOLUS, LEO, Ph.D. (University of California at Berkeley)
Professor, Food and Resource Economics

POLSTON, JANE E., Ph.D. (University of California at Riverside)
Assistant Professor, Plant Pathology

POOLE, REID, M.A. (University of Chicago)
Professor, Music

POP STOJANOVIC, ZORAN R., Ph.D. (Faculty for Mathematical and Natural Sciences in Belgrade)
Professor, Mathematics

POPENOE, HUGH L., Ph.D. (University of Florida)
Professor, Soil and Water Science

POPOV, VASILE M., Ph.D. (Romanian Academy)
Professor, Mathematics

POPP, DANIEL M., Ph.D. (University of Chicago)
Associate Professor, Germanic and Slavic Languages and Literatures

PORTER, CHARLOTTE M., Ph.D. (Harvard University)
Associate Professor, History

PORTER, SANFORD D., Ph.D. (Florida State University)
Assistant Professor, Entomology and Nematology

PORTIER, KENNETH M., Ph.D. (University of North Carolina)
Associate Professor, Statistics

POSNER, PHILIP, Ph.D. (State University of New York)
Professor, Physiology

POTTS, WAYNE K., Ph.D. (University of Washington)
Assistant Professor, Pathology and Laboratory Medicine

POWELL, CHARLES A., Ph.D. (University of Nebraska)
Associate Professor, Plant Pathology

POWELL, DAVID H., Ph.D. (University of Florida)
Associate Scientist, Chemistry

POWELL, GEORGE V., Ph.D. (University of California at Davis)
Assistant Professor, Forest Resources and Conservation

POWELL, PADGETT, M.A. (University of Houston)
Professor, English

POWELL, WILLIAM R., Ed.D. (Indiana University)
Professor, Instruction and Curriculum

POWERS, SCOTT K., Ph.D. (Louisiana State University)
Professor, Exercise and Sport Sciences

POYNOR, ROBIN E., Ph.D. (Indiana University)
Associate Professor, Art

POZZETTA, GEORGE E., Ph.D. (University of North Carolina)
Professor, History

PRESNELL, BRETT D., Ph.D. (Florida State University)
Assistant Professor, Statistics

PRESTON, JAMES F., III, Ph.D. (University of Minnesota)
Professor, Microbiology and Cell Science

PREVIC, EDWARD P., Ph.D. (University of Illinois)
Associate Professor, Microbiology and Cell Science

PRICE, DONALD R., Ph.D. (Purdue University)
Professor, Agricultural Engineering

PRICE, JAMES F., Ph.D. (Clemson University)
Associate Professor, Entomology and Nematology

PRICHARD, DAVID L., Ph.D. (University of Florida)
Associate Professor, Animal Science

PRIETO, ADOLFO P., Ph.D. (University of Buenos Aires)
Graduate Research Professor, Romance Languages and Literatures

PRINCIPE, JOSE C., Ph.D. (University of Florida)
Professor, Electrical Engineering

PRINE, GORDON M., Ph.D. (Ohio State University)
Professor, Agronomy

PRING, DARYL R., Ph.D. (North Dakota State University)
Professor, Plant Pathology

PROBERT, BARBARA S., Ph.D. (University of Florida)
Associate Professor, Psychology

PROCTOR, CHARLES L., Ph.D. (Purdue University)
Associate Professor, Mechanical Engineering

PROCTOR, SAMUEL, Ph.D. (University of Florida)
Distinguished Service Professor, History

PROGULSKE-FOX, ANN, Ph.D. (University of Massachusetts)
Associate Professor, Oral Biology

PROKAI, LASZLO, Ph.D. (Vezprem University)
Assistant Professor, Pharmaceutics

PROPERZIO, WILLIAM S., Ph.D. (University of Florida)
Associate Professor, Environmental Engineering Sciences

PRUGH, PETER E., M.Arch. (Harvard University)
Associate Professor, Architecture

PURCIFULL, DAN E., Ph.D. (University of California at Davis)
Professor, Plant Pathology

PURDY, BARBARA A., Ph.D. (University of Florida)
Professor, Anthropology

PURDY, LAURENCE H., Ph.D. (University of California at Davis)
Professor, Plant Pathology

PURICH, DANIEL L. Ph.D. (Iowa State University)
Professor, Biochemistry and Molecular Biology

PUTZ, FRANCIS E., Ph.D. (Cornell University)
Professor, Botany

QIU, ZONGAN, Ph.D. (University of Chicago)
Assistant Professor, Physics

QUESENBERRY, KENNETH H., Ph.D. (University of Kentucky)
Professor, Agronomy

RADCLIFFE, ROBERT C., Ph.D. (Ohio State University)
Associate Professor, Finance, Insurance, and Real Estate

RADELET, MICHAEL L., Ph.D. (Purdue University)
Professor, Sociology

RAE, DARRELL O., D.V.M. (Colorado State University)
Assistant Professor, Veterinary Medicine

RAID, RICHARD N., Ph.D. (Pennsylvania State University)
Associate Professor, Plant Pathology

RAIZADA, MOHAN K., Ph.D. (University of Kanpur)
Professor, Physiology

RAMAN, KALYAN, Ph.D. (University of Texas at Dallas)
Assistant Professor, Marketing

RAMASWAMY, VELLAYAN, Ph.D. (Northwestern University)
Professor, Electrical Engineering

RAMOND, PIERRE, Ph.D. (Syracuse University)
Professor, Physics

RAMPHAL, REUBEN, M.D. (McGill University)
Associate Professor, Immunology and Medical Microbiology

RAND, COLLEEN S., Ph.D. (Stanford University)
Associate Professor, Nursing

RAND, KENNETH H., M.D. (Stanford University)
Professor, Pathology and Laboratory Medicine

RANDAZZO, ANTHONY F., Ph.D. (University of North Carolina)
Professor, Geology

RANDLES, RONALD H., Ph.D. (Florida State University)
Professor, Statistics

RANELLI, PAUL L., Ph.D. (University of Wisconsin)
Assistant Professor, Pharmacy Health Care Administration

RAO, KOPPAKA V., Ph.D. (University of Wisconsin)
Professor, Medicinal Chemistry

RAO, MURALI, Ph.D. (Tata Institute)
Professor, Mathematics

RAO, PALAKURTHI S., Ph.D. (University of Hawaii)
Graduate Research Professor, Soil and Water Science

RAO, PEJAVER V., Ph.D. (University of Georgia)
Professor, Statistics

RAREY, KYLE E., Ph.D. (Indiana University)
Associate Professor, Anatomy and Cell Biology

RASKIN, ROSE E., Ph.D. (Michigan State University)
Associate Professor, Veterinary Medicine

RATNESHWAR, SRINIVASAN, Ph.D. (Vanderbilt University)
Assistant Professor, Marketing

RAY, GREGORY B., Ph.D. (University of California, Berkeley)
Assistant Professor, Philosophy

RAY, JORDAN B., JR., J.D. (University of Florida)
Professor, Management

RAY, ROBERT B., Ph.D. (Indiana University)
Associate Professor, English

RECHCIGL, JOHN E., Ph.D. (Virginia Polytechnic Institute)
Associate Professor, Soil and Water Science

REDDY, KONDA R., Ph.D. (Louisiana State University)
Graduate Research Professor, Soil and Water Science

REDFORD, KENT H., Ph.D. (Harvard University)
Associate Professor, Latin American Studies

REED HILL, ROBERT E., D.E. (Yale University)
Professor, Materials Science and Engineering

REEP, ROGER L., Ph.D. (Michigan State University)
Associate Professor, Neuroscience

REGNA, JOSEPH L., Ph.D. (Florida State University)
Associate Professor, Recreation, Parks, and Tourism

REICHARD, CARY L., Ed.D. (University of Northern Colorado)
Professor, Special Education

REID, CHARLES E., Ph.D. (Louisiana State University)
Professor, Chemistry

REID, MARK A., Ph.D. (University of Iowa)
Associate Professor, English

REID, WILLIAM R., Ph.D. (Iowa State University)
Professor, Special Education

REIER, PAUL J., Ph.D. (Case Western Reserve University)
Mark F. Overstreet Professor of Neurological Surgery and Neuroscience

REISCHMAN, ROSALYN R., M.S.N. (University of Florida)
Assistant Professor, Nursing

REISKIND, JONATHAN, Ph.D. (Harvard University)
Associate Professor, Zoology

RENNER, RICHARD R., Ph.D. (University of Texas at Austin)
Professor, Foundations of Education

RENNERT, HAL H., Ph.D. (University of Washington)
Associate Professor, Germanic and Slavic Languages and Literatures

RESNICK, JAQUELYN L., Ph.D. (University of Florida)
Professor, Counselor Education

RESNICK, MICHAEL B., Ed.D. (University of Florida)
Professor, Pediatrics

REY, JORGE R., Ph.D. (Florida State University)
Associate Professor, Entomology and Nematology

REYNOLDS, JOHN E., Ph.D. (Iowa State University)
Professor, Food and Resource Economics

REYNOLDS, JOHN R., Ph.D. (University of Massachusetts)
Associate Professor, Chemistry

RHOADS, FREDERIK M., Ph.D. (Mississippi State University)
Professor, Soil and Water Science

RHUE, ROY D., Ph.D. (Oregon State University)
Associate Professor, Soil and Water Science

RICE, WARREN J., Ph.D. (Case Western Reserve University)
Associate Professor, Clinical and Health Psychology

RICH, JIMMY R., Ph.D. (University of California at Riverside)
Professor, Entomology and Nematology

RICHARD, GEORGE A., M.D. (University of Pittsburgh)
Professor, Pediatrics

RICHARDS, NIGEL G., Ph.D. (University of Cambridge)
Assistant Professor, Chemistry

RICHARDS, PAMELA J., Ph.D. (Northwestern University)
Associate Professor, Sociology

RICHARDSON, BRIAN E., Ph.D. (University of Washington)
Assistant Professor, English

RICHARDSON, DAVID E., Ph.D. (Stanford University)
Associate Professor, Chemistry

RICHARDSON, DAVID M., LL.M. (New York University)
Professor, Taxation

RIDGDILL, GARY D., M.Arch. (Massachusetts Institute of Technology)
Professor, Architecture

RIED, LYLE D., Ph.D. (University of Minnesota)
Associate Professor, Pharmacy Health Care Administration

RIEKERK, HANS, Ph.D. (University of Washington)
Associate Professor, Forest Resources and Conservation

RIENZO, BARBARA A., Ph.D. (Southern Illinois University)
Associate Professor, Health Science Education

RISCO, CARLOS, D.V.M. (University of Florida)
Assistant Professor, Veterinary Medicine

RITTER, GERHARD, Ph.D. (University of Wisconsin)
Professor, Mathematics

RITZ, LOUIS A., Ph.D. (University of Florida)
Associate Professor, Neuroscience

ROAN, VERNON P., JR., Ph.D. (University of Illinois)
Professor, Mechanical Engineering

ROBBINS, RALPH C., Ph.D. (University of Illinois)
Associate Professor, Food Science and Human Nutrition

ROBERGE, CELESTE, M.F.A. (Nova Scotia College of Art & Design)
Assistant Professor, Art

ROBERTS, DANIEL A., Ph.D. (Cornell University)
Professor, Plant Pathology

ROBERTS, LISA N., D.V.M. (University of Georgia)
Assistant Professor, Veterinary Medicine

ROBERTS, STEPHEN M., Ph.D. (University of Utah)
Associate Professor, Veterinary Medicine

ROBINSON, GEOFFREY R., Ph.D. (University of Oxford)
Professor, Mathematics

ROBINSON, J. DANIEL, Pharm. D. (University of Cincinnati)
Professor, Pharmacy Practice

ROBINSON, MICHAEL E., Ph.D. (Bowling Green State University)
Associate Professor, Clinical and Health Psychology

ROBINSON, PAUL L., Ph.D. (University of Warwick)
Associate Professor, Mathematics

ROBINSON, RUSSELL L., Ph.D. (University of Miami)
Associate Professor, Music

ROCKWOOD, DONALD L., Ph.D. (North Carolina State University)
Professor, Forest Resources and Conservation

RODRICK, GARY E., Ph.D. (University of Oklahoma)
Professor, Food Science and Human Nutrition

RODRIGUE, JAMES R., Ph.D. (Memphis State University)
Assistant Professor, Clinical and Health Psychology

ROESSLER, CHARLES E., Ph.D. (University of Florida)
Professor, Environmental Engineering Sciences

ROESSLER, GENEVIEVE S., Ph.D. (University of Florida)
Associate Professor, Nuclear Engineering Sciences

ROHDE, DAVID W., Ph.D. (University of Rochester)
Eminent Scholar, Political Science

ROLAND, DENNIS C., Ed.D. (Illinois State University)
Associate Professor, Art

ROMANO, RICHARD E., Ph.D. (University of Pittsburgh)
Associate Professor, Economics

ROMRELL, LYNN J., Ph.D. (Utah State University)
Professor, Anatomy and Cell Biology

ROOSENRAAD, JON A., Ph.D. (Florida State University)
Professor, Journalism and Communications

ROSALSKY, ANDREW J., Ph.D. (Rutgers State University)
Professor, Statistics

ROSE, RICHARD A., M.F.A., (Connecticut College)
Associate Professor, Theatre

ROSENBAUM, WALTER A., Ph.D. (Princeton University)
Professor, Political Science

ROSS, CLAUDIUS A., Ph.D. (University of Florida)
Professor, Aerospace Engineering, Mechanics, and Engineering Science

ROSS, DORENE D., Ed.D. (University of Virginia)
Professor, Instruction and Curriculum

ROSS, MICHAEL H., Ph.D. (New York University)
Professor, Anatomy and Cell Biology

ROTHMAN, HOWARD B., Ph.D. (Stanford University)
Professor, Communication Processes and Disorders

ROUSEFF, RUSSELL L., Ph.D. (University of Georgia)
Professor, Food Science and Human Nutrition

ROWE, MARY B., Ph.D. (Stanford University)
Professor, Instruction and Curriculum

ROWE, THOMAS C., Ph.D. (University of Florida)
Associate Professor, Pharmacology and Therapeutics

ROWLAND, NEIL E., Ph.D. (University of London)
Professor, Psychology

RUDNYTSKY, PETER L., Ph.D. (Yale University)
Associate Professor, English

RUSH, MARK E., Ph.D. (University of Rochester)
Professor, Economics

RUTH, BYRON E., Ph.D. (West Virginia University)
Professor, Civil Engineering

RUTLEDGE, DAVID R., Pharm.D. (University of Texas)
Associate Professor, Pharmacy Practice

RUTMAN, DARRETT B., Ph.D. (University of Virginia)
Graduate Research Professor, History

RYNGAERT, MICHAEL D., Ph.D. (University of Chicago)
Associate Professor, Finance, Insurance, and Real Estate

RYSCHKEWITSCH, GEORGE E., Ph.D. (Ohio State University)
Professor, Chemistry

SABATELLA, JOSEPH J., M.F.A. (University of Illinois)
Professor, Art

SABIN, JOHN R., Ph.D. (University of New Hampshire)
Professor, Physics

SACKS, MICHAEL D., Ph.D. (University of California at Berkeley)
Professor, Materials Science and Engineering

SAFA, HELEN I., Ph.D. (Columbia University)
Professor, Latin American Studies

SAH, CHIH-TANG, Ph.D. (Stanford University)
Graduate Research Professor, Electrical Engineering

SAHNI, SARTAJ, Ph.D. (Cornell University)
Professor, Computer and Information Sciences

SALTIEL, CRAIG J., Ph.D. (Tel Aviv University)
Assistant Professor, Mechanical Engineering

SALYANI, MASOUD, Ph.D. (North Carolina State University)
Associate Professor, Agricultural Engineering

SAMUELSON, DON A., Ph.D. (University of Florida)
Associate Professor, Veterinary Medicine

SAND, ROBERT S., Ph.D. (University of Kentucky)
Associate Professor, Animal Science

SANDEEN, CARL A., Ph.D. (Michigan State University)
Professor, Educational Leadership

SANDERSON, STEVEN E., Ph.D. (Stanford University)
Professor, Political Science

SANDOR, MARJORIE J., Ph.D. (University of Iowa)
Associate Professor, English

SANFORD, MALCOLM T., Ph.D. (University of Georgia)
Professor, Entomology and Nematology

SANKAR, BHAVANI V., Ph.D. (Purdue University)
Associate Professor, Aerospace Engineering, Mechanics, and Engineering Science

SAPPINGTON, DAVID, Ph.D. (Princeton University)
Lanzilotti-McKethan Professor, Economics

SARGENT, STEVEN A., Ph.D. (Michigan State University)
Associate Professor, Horticultural Science

SARTAIN, JERRY B., Ph.D. (North Carolina State University)
Professor, Soil and Water Science

SAWYER, ALAN G., Ph.D. (Stanford University)
Professor, Marketing

SAWYER, HORACE W., Ed.D. (Auburn University)
Professor, Rehabilitation Counseling

SAXON, JOHN P., Ph.D. (University of Georgia)
Professor, Rehabilitation Counseling

SAXON, STEPHEN A., Ph.D. (Florida State University)
Associate Professor, Mathematics

SCANZONI, JOHN H., Ph.D. (University of Oregon)
Professor, Sociology

SCARPACE, NIHAL T., Ph.D. (Hacettepe University)
Assistant Professor, Pharmacology and Therapeutics

SCARPACE, PHILIP J., Ph.D. (University of Rochester)
Associate Professor, Pharmacology and Therapeutics

SCARPELLO, VIDA, Ph.D. (University of Minnesota)
Associate Professor, Management

SCHAEFER, JOSEPH M., Ph.D. (Iowa State University)
Assistant Professor, Forest Resources and Conservation

SCHAFER, DANIEL L., Ph.D. (University of Minnesota)
Professor, History

SCHAFFER, BRUCE A., Ph.D. (Virginia Polytechnic Institute)
Associate Professor, Horticultural Sciences

SCHALL, JAN T., Ph.D. (University of Texas at Austin)
Assistant Professor, Art

SCHANK, STANLEY C., Ph.D. (University of California at Davis)
Professor, Agronomy

SCHANZE, KIRK S., Ph.D. (University of North Carolina at Chapel Hill)
Associate Professor, Chemistry

SCHAUB, JAMES H., Ph.D. (Purdue University)
Distinguished Service Professor, Civil Engineering

SCHAUBLE, PAUL G., Ph.D. (Michigan State University)
Professor, Psychology

SCHEAFFER, RICHARD, Ph.D. (Florida State University)
Professor, Statistics

SCHEFFER, GEORGE, M.A.Arch. (University of Florida)
Professor, Architecture

SCHEFFRAHN, RUDOLF H., Ph.D. (University of California at Riverside)
Associate Professor, Entomology and Nematology

SCHELSKE, CLAIRE L., Ph.D. (University of Michigan)
Carl S. Swisher Eminent Scholar in Water Resources

SCHER, RICHARD K., Ph.D. (Columbia University)
Associate Professor, Political Science

SCHIFFENBAUER, JOEL, M.D. (Albert Einstein College of Medicine)
Associate Professor, Immunology and Medical Microbiology

SCHLENKER, BARRY R., Ph.D. (State University of New York at Albany)
Professor, Psychology

SCHMELING, GARETH L., Ph.D. (University of Wisconsin)
Professor, Classics

SCHMID, GERHARD M., Ph.D. (University of Innsbruck)
Associate Professor, Chemistry

SCHMIDT, PATRICIA, Ph.D. (Pennsylvania State University)
Associate Professor, English

SCHMIDT, PETER R., Ph.D. (Northwestern University)
Associate Professor, Anthropology

SCHMIDT, ROBERT A., Ph.D. (Pennsylvania State University)
Professor, Forest Resources and Conservation

SCHMIDT, ROBERT R., Ph.D. (Virginia Polytechnic Institute)
Graduate Research Professor, Microbiology and Cell Science

SCHMIDT, RONALD H., Ph.D. (University of Minnesota)
Professor, Food Science and Human Nutrition

SCHMINK, MARIANNE C., Ph.D. (University of Texas at Austin)
Professor, Latin American Studies

SCHNEIDER, JENNIFER, M.A. (University of North Carolina at Chapel Hill)
Assistant Professor, Theatre

SCHNEIDER, RICHARD H., Ph.D. (University of Florida)
Associate Professor, Urban and Regional Planning

SCHNEIDER, RICHARD T., Ph.D. (University of Stuttgart)
Professor, Nuclear Engineering Sciences

SCHOESSOW, GLEN J., M.S.M.E. (Purdue University)
Professor, Nuclear Engineering Sciences

SCHOLES, ROBERT J., Ph.D. (Indiana University)
Professor, Communication Processes and Disorders

SCHREIER, HANS, Ph.D. (Swiss Federal institute of Technology)
Associate Professor, Pharmaceutics

SCHROETER, DANIEL J., Ph.D. (University of Manchester)
Associate Professor, History

SCHUELLER, JOHN K., Ph.D. (Purdue University)
Associate Professor, Mechanical Engineering

SCHUELLER, MALINI J., Ph.D. (Purdue University)
Associate Professor, English

SCHULMAN, STEPHEN G., Ph.D. (University of Arizona)
Professor, Medicinal Chemistry

SCHULTZ, GREGORY S., Ph.D. (Oklahoma State University)
Professor, Biochemistry and Molecular Biology

SCHUSTER, DAVID J., Ph.D. (Oklahoma State University)
Professor, Entomology and Nematology

SCHUSTER, SHELDON M., Ph.D. (University of Arizona)
Professor, Biochemistry and Molecular Biology

SCHUTTE, OFELIA, Ph.D. (Yale University)
Associate Professor, Philosophy

SCHWARTZ, BETH C., Ph.D. (Cornell University)
Assistant Professor, English

SCHWARTZ, MICHAEL A., Ph.D. (University of Wisconsin)
Professor, Pharmaceutics

SCHWARTZ, STUART E., Ed.D. (University of Kansas)
Professor, Special Education

SCHWASSMANN, HORST O., Ph.D. (University of Wisconsin)
Professor, Zoology

SCICCHITANO, MICHAEL J., Ph.D. (University of Georgia)
Associate Professor, Political Science

SCORNIK, JUAN C., M.D. (University of La Plata)
Professor, Pathology and Laboratory Medicine

SCOTT, JAMES E., Ph.D. (University of Michigan)
Associate Professor, Counselor Education

SCOTT, JOHN F., Ph.D. (Columbia University)
Associate Professor, Art

SCOTT, JOHN W., Ph.D. (Ohio State University)
Professor, Horticultural Science

SCOTT, KATHERINE N., Ph.D. (University of Florida)
Professor, Nuclear Engineering Sciences

SCULLY, BRIAN T., Ph.D. (Cornell University)
Assistant Professor, Horticultural Science

SEALE, JAMES L., Ph.D. (Michigan State University)
Associate Professor, Food and Resource Economics

SEAMAN, WILLIAM, JR., Ph.D. (University of Florida)
Associate Professor, Forest Resources and Conservation

SEAWRIGHT, JACK A., Ph.D. (University of Florida)
Associate Professor, Entomology and Nematology

SECCOMBE, KAREN, Ph.D. (Washington State University)
Associate Professor, Sociology

SEELYE, JOHN D., Ph.D. (Claremont College)
Graduate Research Professor, English

SEGAL, CORIN, Ph.D. (University of Virginia)
Assistant Professor of Aerospace Engineering, Mechanics, and Engineering Science

SEGAL, RICHARD, Ph.D. (Virginia Commonwealth University)
Associate Professor, Pharmacy

SEIBERLING, LUCY E., Ph.D. (California Institute of Technology)
Associate Professor, Physics

SEIREG, ALI A., Ph.D. (University of Wisconsin)
Ebaugh Professor, Mechanical Engineering

SELF, MORIS W., Ph.D. (University of Minnesota)
Professor, Civil Engineering

SELFRIDGE, RALPH G., Ph.D. (University of Oregon)
Professor, Mathematics

SELMAN, KAY E., Ph.D. (Harvard University)
Associate Professor, Anatomy and Cell Biology

SEMPLE-ROWLAND, SUSAN L, Ph.D. (University of Florida)
Assistant Scientist, Neuroscience

SEVERY, LAWRENCE J., Ph.D. (University of Colorado)
Professor, Psychology

SEYMOUR, SANDRA F., Ph.D. (Florida State University)
Associate Professor, Nursing

SHAAK, GRAIG D., Ph.D. (University of Pittshurgh)
Assistant Professor, Geology

SHAFER, WILLARD G., M.M.E. (Rensselaer Polytechnic Institute)
Associate Professor, Civil Engineering

SHAH, DINESH O., Ph.D. (Columbia University)
Professor, Chemical Engineering

SHANDS, JOSEPH W., JR., M.D. (Duke University)
Professor, Immunology and Medical Microbiology

SHANKER, AJAY, Ph.D. (Texas Technical University)
Assistant Professor, Building Construction

SHANMUGAM, KEELNATHAM, Ph.D. (University of Hawaii)
Professor, Microbiology and Cell Science

SHARON, BOAZ, M.M. (Boston University)
Professor, Music

SHARP, BERT L., Ed.D. (University of Florida)
Professor, Counselor Education

SHARP, DANIEL C., III, Ph.D. (University of Massachusetts)
Professor, Animal Science

SHARP, KEVIN M., D.M.A. (University of Indiana)
Assistant Professor, Music

SHATTERS, ROBERT G., Ph.D. (Washington State University)
Assistant Professor, Agronomy

SHAW, GERARD P., Ph.D. (University of London)
Associate Professor, Neuroscience

SHAW, HARRY B., Ph.D. (University of Illinois)
Associate Professor, English

SHAW, LAWRANCE N., Ph.D. (Ohio State University)
Professor, Agricultural Engineering

SHAW, LELAND G., M.Arch. (University of California at Berkeley)
Professor, Architecture

SHAW, LINDA R., Ph.D. (Florida State University)
Assistant Professor, Rehabilitation Counseling

SHEARER, JAN K., D.V.M. (Ohio State University)
Associate Professor, Veterinary Medicine—IFAS

SHEEHAN, THOMAS J., Ph.D. (Cornell University)
Professor, Horticultural Science

SHEHAN, CONSTANCE L., Ph.D. (Pennsylvania State University)
Associate Professor, Sociology

SHELTON, DAVID L., Ph.D. (University of Missouri)
Associate Professor, Theatre

SHEN, CHIAYI, Ph.D. (University of Cincinnati)
Associate Professor, Materials Science and Engineering

SHEN, LI-CHIEN, Ph.D. (University of Wisconsin)
Associate Professor, Mathematics

SHENG, Y. P., Ph.D. (Case Western Reserve University)
Professor, Coastal and Oceanographic Engineering

SHEPARD, HERSCHEL E., M.F.A. (Victoria University)
Lecturer, Architecture

SHEPPARD, DONALD M., Ph.D. (Arizona State University)
Professor, Coastal and Oceanographic Engineering

SHEPPERD, JAMES A., Ph.D. (University of Missouri)
Assistant Professor, Psychology

SHERIF, SHERIF A., Ph.D. (Iowa State University)
Associate Professor, Mechanical Engineering

SHERMAN, ROBERT R., Ed.D. (Rutgers State University)
Professor, Foundations of Education

SHERMAN, WAYNE B., Ph.D. (Purdue University)
Professor, Horticultural Science

SHERRARD, PETER A., Ed.D. (University of Massachusetts)
Associate Professor, Counselor Education

SHIELDS, ROBERT P., Ph.D. (Michigan State University) and **D.V.M.** (Auburn University)
Associate Professor, Veterinary Medicine

SHIH, SUN-FU, Ph.D. (North Carolina State University)
Professor, Agricultural Engineering

SHILLE, VICTOR M., Ph.D. (University of California at Davis)
Professor, Veterinary Medicine—IFAS

SHILLING, DONN G., Ph.D. (North Carolina State University)
Associate Professor, Agronomy

SHIREMAN, JEROME V., Ph.D. (Iowa State University)
Professor, Forest Resources and Conservation

SHIREMAN, RACHEL B., Ph.D. (University of Florida)
Professor, Food Science and Human Nutrition

SHIRK, PAUL D., Ph.D. (Texas A&M University)
Assistant Professor, Entomology and Nematology

SHIVERICK, KATHLEEN T., Ph.D. (University of Vermont)
Professor, Pharmacology and Therapeutics

SHOAF, RICHARD A., Ph.D. (Cornell University)
Professor, English

SHOKES, FREDERICK M., Ph.D. (University of Georgia)
Professor, Plant Pathology

SHONKWILER, J. SCOTT, Ph.D. (University of Missouri)
Professor, Food and Resource Economics

SHORT, DONALD E., Ph.D. (University of Nebraska)
Professor, Entomology and Nematology

SHRESTHA, RAMESH L., Ph.D. (University of Wisconsin)
Associate Professor, Civil Engineering

SHUGAN, STEVEN M., Ph.D. (Northwestern University)
Russell Berrie Eminent Scholar, Marketing

SHUKLA, SHAILENDRA S., Ph.D. (Ohio University)
Assistant Professor, Nuclear Engineering Sciences

SHUSTER, JONATHAN J., Ph.D. (McGill University)
Professor, Statistics

SHYY, WEI, Ph.D. (University of Michigan)
Professor, Aerospace Engineering, Mechanics, and Engineering Science

SIDERS, RONALD A., Ph.D. (University of Oregon)
Associate Professor, Exercise and Sport Sciences

SIDMAN, CHARLES F., Ph.D. (University of Wisconsin)
Professor, History

SIEBEIN, GARY W., M.Arch. (University of Florida)
Associate Professor, Architecture

SIEGMANN, DEBORAH W., Ph.D. (University of Miami)
Assistant Professor, Chemistry

SIGLER-EISENBERG, BRENDA J., Ph.D. (New School of Social Research)
Assistant Professor, Anthropology

SIGMON, KERMIT N., Ph.D. (University of Florida)
Associate Professor, Mathematics

SIKIVIE, PIERRE, Ph.D. (Yale University)
Professor, Physics

SILHACEK, DONALD L., Ph.D. (University of Wisconsin)
Professor, Entomology and Nematology

SILVERMAN, DAVID N., Ph.D. (Columbia University)
Professor, Pharmacology and Therapeutics

SILVERSTEIN, JANET H., M.D. (University of Pennsylvania)
Professor, Clinical and Health Psychology

SIMMEN, FRANK A., Ph.D. (University of Hawaii)
Associate Professor, Dairy Science

SIMMEN, ROSALIA C., Ph.D. (University of Hawaii)
Associate Professor, Animal Science

SIMMONS, JOHN K., Ph.D. (Ohio State University)
Distinguished Service Professor, Accounting

SIMMONS, JOSEPH H., Ph.D. (Catholic University)
Professor, Materials Science and Engineering

SIMONE, GARY W., Ph.D. (University of Illinois)
Associate Professor, Plant Pathology

SIMPKINS, JAMES W., Ph.D. (Michigan State University)
Professor, Pharmacodynamics

SIMPSON, JAMES R., Ph.D. (Texas A&M University)
Professor, Food and Resource Economics

SIMPSON, SHARLEEN H., Ph.D. (University of Florida)
Associate Professor, Nursing

SIMS, CHARLES A., Ph.D. (University of Arkansas)
Associate Professor, Food Science and Human Nutrition

SIN, PETER, D.Phil. (Oxford University)
Assistant Professor, Mathematics

SINCLAIR, THOMAS R., Ph.D. (Cornell University)
Professor, Agronomy

SINDELAR, PAUL T., Ph.D. (University of Minnesota)
Professor, Special Education

SINGER, ROBERT N., Ph.D. (Ohio State University)
Professor, Exercise and Sport Sciences

SINGH, MEGH, Ph.D. (University of Florida)
Professor, Horticultural Science

SINGH, RAJIV K., Ph.D. (North Carolina State University)
Assistant Professor, Materials Science and Engineering

SINGLETON, GEORGE T., M.D. (Baylor University)
Professor, Communication Processes and Disorders

SISLER, HARRY H., Ph.D. (University of Illinois)
Distinguished Service Professor, Chemistry

SITREN, HARRY S., Ph.D. (Rutgers State University)
Associate Professor, Food Science and Human Nutrition

SIVAZLIAN, BOGHOS D., Ph.D. (Case Western Reserve University)
Professor, Industrial and Systems Engineering

SIVINSKI, JOHN M., Ph.D. (University of Florida)
Assistant Professor, Entomology and Nematology

SKELLY, ROBERT C., M.F.A. (Indiana University)
Professor, Art

SLANSKY, FRANK, JR., Ph.D. (Cornell University)
Professor, Entomology and Nematology

SLAWSON, BRIAN, M.F.A. (University of Michigan)
Assistant Professor, Art

SLOAN, DON R., Ph.D. (University of Florida)
Associate Professor, Poultry Science

SLOAN, KENNETH B., Ph.D. (University of Missouri)
Associate Professor, Medicinal Chemistry

SLUTSKY, STEVEN M., Ph.D. (Yale University)
Associate Professor, Economics

SMAJSTRLA, ALLEN G., Ph.D. (Texas A&M University)
Professor, Agricultural Engineering

SMALL, PARKER A., JR., M.D. (University of Cincinnati)
Professor, Immunology and Medical Microbiology

SMART, G. C., JR., Ph.D. (University of Wisconsin)
Professor, Entomology and Nematology

SMERAGE, GLEN H., Ph.D. (Stanford University)
Associate Professor, Agricultural Engineering

SMEYAK, GERALD P., Ph.D. (Ohio University)
Professor, Journalism and Communications

SMITH, ALBERT B., Ph.D. (University of North Carolina)
Professor, Romance Languages and Literatures

SMITH, ALBERT B., III, Ph.D. (University of Michigan)
Professor, Educational Leadership

SMITH, ALEX G., Ph.D. (Duke University)
Distinguished Service Professor, Astronomy

SMITH, CAMILLE M., Ph.D. (Indiana University)
Associate Professor, Music

SMITH, DAVID C., Ph.D. (Northwestern University)
Professor, Educational Leadership

SMITH, DOUGLAS L., Ph.D. (University of Minnesota)
Professor, Geology

SMITH, F. LESLIE, Ph.D. (Florida State University)
Professor, Journalism and Communications

SMITH, HALBERT C., JR., D.B.A. (University of Illinois)
Professor, Finance, Insurance, and Real Estate

SMITH, HAYWOOD C., JR., Ph.D. (University of Virginia)
Associate Professor, Astronomy

SMITH, HERRICK H., M.L.A. (University of Georgia)
Professor, Landscape Architecture

SMITH, JACK R., Ph.D. (University of Southern California)
Professor, Electrical Engineering

SMITH, JULIAN, M.A. (Tulane University)
Professor, English

SMITH, KEVIN S., Ph.D. (University of Florida)
Associate Professor, Mechanical Engineering

SMITH, LINDA J., Ph.D. (University of Texas at Austin)
Assistant Professor, Pathology and Laboratory Medicine

SMITH, MARC T., Ph.D. (Ohio State University)
Assistant Professor, Finance, Insurance, and Real Estate

SMITH, NAN S., M.F.A. (Ohio State University)
Associate Professor, Art

SMITH, NIGEL J.H., Ph.D. (University of California at Berkeley)
Professor, Geography

SMITH, REX L., Ph.D. (Iowa State University)
Professor, Agronomy

SMITH, RICHARD C., Ph.D. (Duke University)
Professor, Botany

SMITH, RICHARD T., M.D. (Tulane University)
Professor, Pathology and Laboratory Medicine

SMITH, RICK L., Ph.D. (Pennsylvania State University)
Associate Professor, Mathematics

SMITH, SCOT E., Ph.D. (University of Michigan)
Associate Professor, Civil Engineering

SMITH, STANLEY K., Ph.D. (University of Michigan)
Professor, Economics

SMITH, STEPHANIE A., Ph.D. (University of California at Berkeley)
Assistant Professor, English

SMITH, STEPHEN W., Ph.D. (University of Kansas)
Assistant Professor, Special Education

SMITH, SUZANNA D., Ph.D. (University of Georgia)
Associate Professor, Sociology

SMITH, WAYNE H., Ph.D. (Mississippi State University)
Professor, Forest Resources and Conservation

SMITTLE, BURRELL, J., Ph.D. (Rutgers State University)
Professor, Entomology and Nematology

SMOCOVITIS, VASSILIKI BETTY, Ph.D. (Cornell University)
Assistant Professor, History

SMYTH, KATHLEEN A., Ed.D. (Columbia University)
Professor, Nursing

SNIDER, MARTHA J., Ed.D. (University of Florida)
Associate Professor, Nursing

SNINSKY, CHARLES A., M.D. (Temple University)
Associate Professor, Pharmacodynamics

SNODGRASS, CHRIS G., Ph.D. (State University of New York at Buffalo)
Associate Professor, English

SNOWBALL, DOUG A., Ph.D. (University of Washington)
Professor, Accounting

SNYDER, GEORGE H., Ph.D. (Ohio State University)
Professor, Soil and Water Science

SNYDER, PATRICIA, Ph.D. (University of California at San Diego)
Assistant Professor, Chemistry

SOARES, GLAUCIO A., Ph.D. (Washington University)
Professor, Latin American Studies

SODERHOLM, KARL J., D.D.S. (University of Umea, Sweden)
Professor, Materials Science and Engineering

SOLLENBERGER, LYNN E., Ph.D. (University of Florida)
Associate Professor, Agronomy

SOMMERVILLE, CHARLES J., Ph.D. (University of Iowa)
Professor, History

SONODA, RONALD M., Ph.D. (University of California at Davis)
Professor, Plant Pathology

SORKIN, ROBERT D., Ph.D. (University of Michigan)
Professor, Psychology

SOUTHWICK, FREDERICK S., M.D. (Columbia University)
Professor, Immunology and Medical Microbiology

SPANGLER, BYRON D., M.S. (University of Florida)
Professor, Civil Engineering

SPANGLER, DANIEL P., Ph.D. (University of Arizona)
Associate Professor, Geology

SPANIER, JOHN W., Ph.D. (Yale University)
Professor, Political Science

SPECTOR, ALAN C., Ph.D. (Florida State University)
Assistant Professor, Psychology

SPENCE, MUNEERA, M.F.A. (Yale University)
Associate Professor, Art

SPITZNAGEL, RONALD J., Ed.D. (Auburn University)
Associate Professor, Rehabilitation Counseling

SPREEN, THOMAS H., Ph.D. (Purdue University)
Professor, Food and Resource Economics

SPRENKEL, RICHARD K., Ph.D. (University of Illinois)
Associate Professor, Entomology and Nematology

SPRING, ANITA, Ph.D. (Cornell University)
Professor, Anthropology

SQUILLACE, ANTHONY E., Ph.D. (University of Florida)
Professor, Forest Resources and Conservation

SRIVASTAVA, RAMAKANT, Ph.D. (Indiana University)
Professor, Electrical Engineering

STAAB, EDWARD V., Ph.D. (University of Minnesota)
Professor, Nuclear Engineering Sciences

STACPOOLE, PETER W., Ph.D. (University of California at San Francisco)
Professor, Pharmacology and Therapeutics

STAHMER, HAROLD M., Ph.D. (Cambridge University)
Professor, Religion

STAINSBY, WENDELL N., Sc.D. (Johns Hopkins University)
Professor, Physiology

STALL, ROBERT E., Ph.D. (Ohio State University)
Professor, Plant Pathology

STALL, WILLIAM M., Ph.D. (University of Florida)
Professor, Horticultural Science

STAMPS, ROBERT H., Ph.D. (University of Florida)
Associate Professor, Horticultural Science

STANGE, LIONEL A., Ph.D. (University of California at Davis)
Associate Professor, Entomology and Nematology

STANELY, CRAIG D., Ph.D. (Iowa State University of Science and Technology)
Associate Professor, Soil and Water Science

STANLEY, DAVID J., Ph.D. (Pennsylvania State University)
Associate Professor, Art

STANLEY, HAROLD R., D.D.S. (University of Maryland)
Professor, Pathology and Laboratory Medicine

STANLEY, ROBERT L., JR., Ph.D. (University of Georgia)
Associate Professor, Agronomy

STANSLY, PHIL A., Ph.D. (Texas A&M University)
Associate Professor, Entomology and Nematology

STANTON, CHRISTOPHER J., Ph.D. (Cornell University)
Associate Professor, Physics

STAPLES, CHARLES R., Ph.D. (University of Illinois)
Associate Professor, Dairy Science

STARK, CHRISTOPHER W., Ph.D. (University of Michigan)
Associate Professor, Mathematics

STARNES, EARL M., Ph.D. (Florida State University)
Professor, Urban and Regional Planning

STAUDHAMMER, JOHN, Ph.D. (University of California at Los Angeles)
Professor, Electrical Engineering

STEARMAN, ALLYN M., Ph.D. (University of Florida)
Associate Professor, Anthropology

STECHMILLER, JOYCE K., Ph.D. (University of Florida)
Associate Professor, Nursing

STECK, GARY J. Ph.D. (University of Tunis)
Assistant Professor, Entomology and Nematology

STEHOUWER, DONALD J., Ph.D. (Princeton University)
Associate Professor, Psychology

STEIN, GERALD H., M.D. (University of Pennsylvania)
Assistant Professor, Medicine

STEIN, JAY M., Ph.D. (University of Michigan)
Professor, Urban and Regional Planning

STEPHAN, ALEXANDER F., Ph.D. (Princeton University)
Professor, Germanic and Slavic Languages and Literatures

STEPHAN, HALINA, Ph.D. (University of Michigan)
Associate Professor, Germanic and Slavic Languages and Literatures

STERN, WILLIAM L., Ph.D. (University of Illinois)
Professor, Botany

STETSON, DOROTHY M., Ph.D. (Vanderbilt University)
Assistant Professor, Political Science

STEVENS, BRUCE R., Ph.D. (Illinois State University)
Associate Professor, Physiology

STEWART, GREGORY R., Ph.D. (Stanford University)
Professor, Physics

STEWART, RONALD B., M.S.P. (University of Florida)
Professor, Pharmacy Practice

STIMAC, JERRY L., Ph.D. (Oregon State University)
Professor, Entomology and Nematology

STODDARD, ANN H., Ed.D. (University of Georgia)
Associate Professor, Instruction and Curriculum

STOFFELLA, PETER J., Ph.D. (Cornell University)
Professor, Horticultural Science

STONE, EARL L., Ph.D. (Cornell University)
Professor, Soil and Water Science

STOPKA, CHRISTINE BOYD, Ph.D. (University of Virginia)
Associate Professor, Exercise and Sport Sciences

STOUFER, ROBERT C., Ph.D. (Ohio State University)
Associate Professor, Chemistry

STOUT, FRANK W., D.D.S. (University of Detroit)
Associate Professor, Dentistry

STRANDBERG, JAMES O., Ph.D. (University of Wisconsin)
Professor, Plant Pathology

STRAUGHN, ALTO A., Ph.D. (University of Wisconsin)
Professor, Agricultural Education and Communication

STRAUS, BARRIE R., Ph.D. (University of Iowa)
Associate Professor, English

STRAYER, JOHN R., Ph.D. (Clemson University)
Professor, Entomology and Nematology

STREETMAN, EDITH Y., B.A. (Florida State University)
Professor, Art

STREIB, GORDON F., Ph.D. (Columbia University)
Graduate Research Professor, Sociology

STREIFF, RICHARD R., M.D. (University of Basel)
Professor, Medicinal Chemistry

STREIT, WOLFGANG J., Ph.D. (Medical University of South Carolina)
Assistant Professor, Neuroscience

STROH, ROBERT C., SR., Ph.D. (Pennsylvania State University)
Associate Professor, Building Construction

STROHBACH, MARY ELLEN, Ph.D. (University of Florida)
Associate Professor, Nursing

STRUHSAKER, THOMAS T., Ph.D. (University of California at Berkeley)
Professor, Forest Resources and Conservation

STURGILL, CLAUDE C., Ph.D. (University of Kentucky)
Professor, History

SU, NAN-YAO, Ph.D. (University of Hawaii)
Associate Professor, Entomology and Nematology

SU, STANLEY Y., Ph.D. (University of Wisconsin)
Professor, Electrical Engineering

SUAREZ, SUSAN S., Ph.D. (University of Virginia)
Associate Professor, Veterinary Medicine

SUCHMAN, DAVID, I., Ph.D. (Ohio State University)
Professor, Psychology

SULLIVAN, NEIL S., Ph.D. (Harvard University)
Professor, Physics

SULLIVAN, WILLIAM J., III, Ph.D. (Yale University)
Associate Professor, Germanic and Slavic Languages and Literatures

SUMMERHILL, WILLIAM R., JR., Ed.D. (North Carolina State University)
Professor, Agricultural Education and Communication

SUMMERS, STEPHEN J., Ph.D. (Harvard University)
Associate Professor, Mathematics

SUMNERS, COLIN, Ph.D. (University of Southhampton)
Professor, Physiology

SUN, CHANG-TSAN, D.E. (Yale University)
Professor, Aerospace Engineering, Mechanics, and Engineering Science

SUNDLOF, STEPHEN F., Ph.D. (University of Illinois)
Associate Professor, Veterinary Medicine

SUNQUIST, MELVIN E., Ph.D. (University of Minnesota)
Associate Scientist, Forest Resources and Conservation

SUSSMAN, LEWIS A., Ph.D. (University of North Carolina)
Associate Professor, Classics

SUTHERLAND, JOHN C., Ph.D. (Michigan State University)
Associate Professor, Journalism and Communications

SUTTON, DAVID L., Ph.D. (Virginia Polytechnic Institute)
Professor, Agronomy

SVORONOS, SPYROS, Ph.D. (University of Minnesota)
Associate Professor, Chemical Engineering

SWAIN, RALPH W., Ph.D. (Cornell University)
Professor, Industrial and Systems Engineering

SWANSON, BERT E., Ph.D. (University of Oregon)
Professor, Political Science

SWANSON, MAURICE S., Ph.D. (University of California at Berkeley)
Assistant Professor, Immunology and Medical Microbiology

SYLVIA, DAVID M., Ph.D. (Cornell University)
Professor, Soil and Water Science

SYVERTSEN, JAMES P., Ph.D. (New Mexico State University)
Professor, Horticultural Science

TAKANO, YASUMASA, Ph.D. (Helsinki University)
Associate Professor, Physics

TALBOT, MICHAEL T., Ph.D. (University of Florida)
Associate Professor, Agricultural Engineering

TALHAM, DANIEL R., Ph.D. (Johns Hopkins University)
Assistant Professor, Chemistry

TAMPLIN, MARK L., Ph.D. (University of South Florida)
Associate Professor, Food Science and Human Nutrition

TANNER, DAVID B., Ph.D. (Cornell University)
Professor, Physics

TANNER, GEORGE W., Ph.D. (Texas A&M University)
Associate Professor, Forest Resources and Conservation

TANZER, KIM, M.Arch. (North Carolina State University)
Associate Professor, Architecture

TAPLEY, T. C., D.B.A. (Indiana University)
Lecturer, Finance, Insurance, and Real Estate

TATE, SUSAN D., M.S. (University of Tennessee)
Associate Professor, Architecture

TAYLOR, BARBARA E., Ph.D. (University of Wisconsin)
Professor, Agricultural Education and Communication

TAYLOR, CHARLES E., Ph.D. (University of Illinois)
Professor, Aerospace Engineering, Mechanics, and Engineering Science

TAYLOR, CLIFTON L., Ph.D. (University of Wisconsin)
Professor, Agricultural Education and Communication

TAYLOR, FRED J., Ph.D. (University of Colorado)
Professor, Computer and Information Sciences

TAYLOR, TIMOTHY G., Ph.D. (University of Florida)
Professor, Food and Resource Economics

TEAL, PETER E., Ph.D. (University of Florida)
Associate Professor, Entomology and Nematology

TEARE, IWAN D., Ph.D. (Purdue University)
Professor, Agronomy

TEBBETT, IAN R., Ph.D. (University of Strathclyde)
Associate Professor, Pharmaceutics

TEFERTILLER, KENNETH R., Ph.D. (University of Illinois)
Professor, Food and Resource Economics

TEITELBAUM, PHILIP, Ph.D. (Johns Hopkins University)
Graduate Research Professor, Psychology

TEIXEIRA, ARTHUR A., Ph.D. (University of Massachusetts)
Professor, Agricultural Engineering

TENBROECK, SAUNDRA H., Ph.D. (Texas A&M University)
Associate Professor, Animal Science

TENNANT, LEO K., Ph.D. (Florida State University)
Associate Professor, Exercise and Sport Sciences

TERHUNE, JAMES L., Ph.D. (Indiana University)
Professor, Journalism and Communications

THATCHER, WILLIAM W., Ph.D. (Michigan State University)
Graduate Research Professor, Dairy Science

THEBAUT, STEPHEN M., Ph.D. (Purdue University)
Assistant Professor, Computer and Information Sciences

THEIL, HENRI, Ph.D. (University of Amsterdam)
McKethan-Matherly Professor of Econometrics and Decision Sciences

THIEKE, ROBERT J., Ph.D. (University of California at Berkeley)
Assistant Professor, Coastal and Oceanographic Engineerin

THOMAS, CHARLES W., Ph.D. (University of Kentucky)
Professor, Sociology

THOMAS, MICHAEL C., Ph.D. (University of Florida)
Assistant Professor, Entomology and Nematology

THOMPSON, FLOYD J., Ph.D. (Indiana University)
Associate Professor, Neuroscience

THOMPSON, FRED G., Ph.D. (University of Miami)
Professor, Zoology

THOMPSON, JAMES P., Ph.D. (University of Florida)
Associate Professor, Veterinary Medicine

THOMPSON, JESSE C., Ph.D. (University of Illinois)
Assistant Professor, Agricultural Education and Communication

THOMPSON, NEAL P., Ph.D. (Princeton University)
Professor, Food Science and Human Nutrition

THOMPSON, PATRICK A., Ph.D. (University of Wisconsin)
Assistant Professor, Decision and Information Sciences

THOMPSON, PAUL Y., Ph.D. (Massachusetts Institute of Technology)
Professor, Civil Engineering

THOMPSON, ROGER M., Ph.D. (University of Texas at Austin)
Associate Professor, English

THOMSON, EWEN M., Ph.D. (University of Queensland)
Associate Professor, Electrical Engineering

THOMSON, ROBERT S., Ph.D. (Cambridge University)
Associate Professor, English

THORN, CHARLES B., III, Ph.D. (University of California at Berkeley)
Professor, Physics

THORNE, KARL S., M.Arch. (University of Pennsylvania)
Associate Professor, Architecture

THORNTON, LINDA, Ph.D. (Florida State University)
Associate Professor, Recreation, Parks, and Tourism

THRALL, GRANT I., Ph.D. (Ohio State University)
Professor, Geography

THUNBERG, ERIC M., Ph.D. (Virginia Polytechnic Institute)
Assistant Professor, Food and Resource Economics

THURSBY, GENE R., Ph.D. (Duke University)
Associate Professor, Religion

TIA, MANG, Ph.D. (Purdue University)
Professor, Civil Engineering

TICHENOR, DORIS A., Ph.D. (University of Kentucky)
Professor, Agricultural Education and Communication

TIEDERMAN, WILLIAM G., Ph.D. (Stanford University)
Professor, Mechanical Engineering

TILLMAN, CHESTER E., Ed.D. (University of Florida)
Associate Professor, English

TILSON, WILLIAM L., M.Arch (Virginia Polytechnic Institute)
Associate Professor, Architecture

TIMMER, LAVERN W., Ph.D. (University of California at Riverside)
Professor, Plant Pathology

TIPTON, LEONARD P., Ph.D. (University of Wisconsin)
Professor, Journalism and Communications

TISHER, C. CRAIG, M.D. (Washington University)
Eminent Scholar, Anatomy and Cell Science

TLUSTY, JIRI, Ph.D. (Technical University of Prague)
Graduate Research Professor, Mechanical Engineering

TODA, YASUSHI, Ph.D. (Harvard University)
Associate Professor, Economics

TODD, EUGENE A., D.Ed. (University of Houston)
Professor, Instruction and Curriculum

TOLBERT, ELIAS L., Ed.D. (Columbia University)
Professor, Counselor Education

TOSI, HENRY, Ph.D. (Ohio State University)
Professor, Management

TOTH, JOHN P., Ph.D. (Southern Illinois University)
Associate Scientist, Food Science and Human Nutrition

TOU, JULIUS T., D.Eng. (Yale University)
Graduate Research Professor, Electrical Engineering

TOWNSEND, FRANK C., Ph.D.(Oklahoma State University)
Professor, Civil Engineering

TREISE, DEBORAH M., Ph.D. (University of Tennessee)
Assistant Professor, Nursing

TRELOAR, DONNA M., Ph.D. (University of Florida)
Assistant Professor, Nursing

TRIBBY, JAY C., Ph.D. (Johns Hopkins University)
Assistant Professor, History

TRICKEY, SAMUEL B., Ph.D. (Texas A&M University)
Professor, Physics

TROUPIN, EDWARD C., M.M. (University of Michigan)
Professor, Music

TRUEBLOOD, FELICITY M., M.A. (University of Florida)
Associate Research Scholar, Latin American Studies

TSAI, JAMES H., Ph.D. (Michigan State University)
Professor, Entomology and Nematology

TU, CHINGKUANG, Ph.D. (University of Miami)
Associate Scientist, Pharmacology and Therapeutics

TUCKER, CAROLYN M., Ph.D. (State University of New York)
Professor, Psychology

TUFEKCI, SULEYMAN, Ph.D. (Georgia Institute of Technology)
Associate Professor, Industrial and Systems Engineering

TULENKO, JAMES S., M.S. (Massachusetts Institute of Technology)
Professor, Nuclear Engineering Sciences

TUMLINSON, JAMES H., III, Ph.D. (Mississippi State University)
Professor, Entomology and Nematology

TUNG, YAO T., Ph.D. (University of Tennessee)
Assistant Professor, Pathology and Laboratory Medicine

TURIM, MAUREEN, Ph.D. (University of Wisconsin)
Professor, English

TURNER, EDWARD C., Ph.D. (Michigan State University)
Associate Professor, Instruction and Curriculum

TURNER, ELDON R., Ph.D. (University of Kansas)
Assistant Professor, History

TURULL, ALEXANDRE, Ph.D. (University of Chicago)
Professor, Mathematics

TWITCHELL, JAMES B., Ph.D. (University of North Carolina)
Professor, English

TYLER, ANDREA E., Ph.D. (University of Iowa)
Assistant Professor, Linguistics

UDELL, BUDD A., D.M.A. (University of Cincinnati)
Professor, Music

UELSMANN, JERRY N., M.F.A. (Indiana University)
Graduate Research Professor, Art

UHLIK, FELIX, Ph.D. (Pennsylvania State University)
Associate Professor, Building Construction

ULMER, GREGORY L., Ph.D. (Brown University)
Professor, English

UMAN, MARTIN A., Ph.D. (Princeton University)
Professor, Electrical Engineering

UNDEEN, ALBERT H., Ph.D. (University of Illinois)
Associate Professor, Entomology and Nematology

UPHOLD, CONSTANCE R., M.S. (Pennsylvania State University)
Assistant Professor, Nursing

VACALIS, T. DEMETRI, Ph.D. (University of Nebraska at Lincoln)
Professor, Journalism and Communications

VALA, MARTIN T., Ph.D. (University of Chicago)
Professor, Chemistry

VALDES, KAREN W., M.F.A. (Florida State University)
Associate Professor, Art

VALENSTEIN, EDWARD, M.D. (Albert Einstein College of Medicine)
Professor, Neurology

VALLEJOS, C. EDUARDO, Ph.D. (University of California at Davis)
Associate Professor, Horticultural Science

VAN BLOKLAND, PETER J., Ph.D. (University of Illinois)
Professor, Food and Resource Economics

VANDER MEER, ROBERT K., Ph.D. (Pennsylvania State University)
Assistant Professor, Entomology and Nematology

VAN DEUSEN, JULIA M., Ph.D. (University of Southern California)
Professor, Occupational Therapy

VANDIVER, JOSEPH S., Ph.D. (Louisiana State University)
Professor, Sociology

VAN HAAREN, FRANS, Ph.D. (Western Michigan University)
Associate Professor, Psychology

VAN HARTESVELDT, CAROL, Ph.D. (University of Rochester)
Professor, Psychology

VAN HORN, HAROLD H., JR., Ph.D. (Iowa State University)
Professor, Dairy Science

VAN RINSVELT, HENRI A., Ph.D. (University of Utrecht)
Professor, Physics

VANSICKLE, JOHN J., Ph.D. (Iowa State University)
Professor, Food and Resource Economics

VARADARAJAN, RAVICHANDRAN, Ph.D. (University of Pennsylvania)
Assistant Professor, Computer and Information Sciences

VARMA, ARUN K., Ph.D. (University of Alberta)
Professor, Mathematics

VARNES, JILL T., Ed.D. (University of Southern Mississippi)
Associate Professor, Health Science Education

VARNES, PAUL R., Ed.D. (University of Florida)
Professor, Recreation, Parks, and Tourism

VASIL, INDRA K., Ph.D. (University of Delhi)
Graduate Research Professor, Botany

VAVRINA, CHARLES S., Ph.D. (University of Georgia)
Assistant Professor, Horticultural Science

VEMURI, BABA C., Ph.D. (University of Texas at Austin)
Associate Professor, Computer and Information Sciences

VENKATARAMAN, SUBRAMANYA, Ph.D. (University of Wisconsin)
Assistant Professor, Finance, Insurance, and Real Estate

VERA, HERNAN, Ph.D. (University of Kansas)
Associate Professor, Sociology

VERGARA, ELSIE R., Sc.D. (Boston University)
Associate Professor, Occupational Therapy

VERINK, ELLIS D., JR., Ph.D. (Ohio State University)
Distinguished Service Professor, Materials Science and Engineering

VERNETSON, WILLIAM G., Ph.D. (University of Florida)
Associate Engineer, Nuclear Engineering Sciences

VERNON, JACK R., Ph.D. (Northwestern University)
Professor, Economics

VICK, KENNETH W., Ph.D. (Oklahoma State University)
Associate Professor, Entomology and Nematology

VICKROY, THOMAS W., Ph.D. (University of Texas)
Associate Professor, Veterinary Medicine

VIERCK, CHARLES J., JR., Ph.D. (University of Florida)
Professor, Neuroscience

VIESSMAN, WARREN, JR., D.Eng. (Johns Hopkins University)
Professor, Environmental Engineering Sciences

VINCE, ANDREW, Ph.D. (University of Michigan)
Professor, Mathematics

VINCENT, JACK E., Ph.D. (University of Oregon)
Professor, Political Science

VINING, G. GEOFFREY, Ph.D. (Virginia Polytechnic Institute)
Associate Professor, Statistics

VISSCHER, E. M., M.S. (Adelphi University)
Associate Professor, Nursing

VOELKLEIN, HELMUT K., Ph.D. (University of Erlangen)
Assistant Professor, Mathematics

VOGEL, WALTER B., Ph.D. (George Washington University)
Associate Professor, Health Services Administration

VOICHYSONK, BERNARD F., M.F.A. (Yale University)
Professor, Architecture

VON MERING, OTTO, Ph.D. (Harvard University)
Professor, Anthropology

VON OHAIN, HANS J., Ph.D. (University of Gottingen)
Professor, Aerospace Engineering, Mechanics, and Engineering Science

VU-QUOC, LOC, Ph.D. (University of California at Berkeley)
Associate Professor, Aerospace Engineering, Mechanics, and Engineering Science

WACKERLY, DENNIS D., Ph.D. (Florida State University)
Professor, Statistics

WADDILL, VAN H., Ph.D. (Clemson University)
Professor, Entomology and Nematology

WAGENER, KENNETH B., Ph.D. (University of Florida)
Professor, Chemistry

WAGMAN, ROBERT S., Ph.D. (Johns Hopkins University)
Assistant Professor, Classics

WAGNER, ELAINE L., M.A. (University of Texas at Austin)
Professor, Journalism and Communications

WAGNER, PATRICIA A., Ph.D. (University of Wisconsin)
Associate Professor, Food Science and Human Nutrition

WAGNER, WILLIAM G., M.Arch. (Texas A&M University)
Professor, Architecture

WAKELAND, EDWARD K., Ph.D. (University of Hawaii)
Professor, Pathology and Laboratory Medicine

WAKEMAN, DONALD L., M.S.Ag. (University of Florida)
Professor, Animal Science

WALD, KENNETH D., Ph.D. (Washington University)
Professor, Political Science

WALDO, DOUGLAS G., Ph.D. (University of North Carolina)
Associate Professor, Economics

WALKER, CLAY B., Ph.D. (Virginia Polytechnic Institute)
Professor, Oral Biology

WALKER, DON W., Ph.D. (Texas Christian University)
Professor, Neuroscience

WALKER, JAMES K., Ph.D. (Glasgow University)
Professor, Physics

WALKER, KAY F., Ph.D. (University of Florida)
Associate Professor, Occupational Therapy

WALKER, THOMAS J., Ph.D. (Ohio State University)
Professor, Entomology and Nematology

WALLACE, CHARLES E., Ph.D. (University of Florida)
Professor, Civil Engineering

WALLACE, MARGARET R., Ph.D. (Indiana University)
Assistant Professor, Biochemistry and Molecular Biology

WALLACE, ROBIN A., Ph.D. (Columbia University)
Professor, Anatomy and Cell Biology

WALSH, EDWARD K., Ph.D. (Brown University)
Professor, Aerospace Engineering, Mechanics, and Engineering Science

WALSH, THOMAS, Ph.D. (University of Chicago)
Associate Professor, Mathematics

WALSH-CHILDERS, KIM B., Ph.D. (University of North Carolina at Charlotte)
Assistant Professor, Journalism and Communications

WANG, HSIANG, Ph.D. (University of Iowa)
Professor, Coastal and Oceanographic Engineering

WARD, DANIEL B., Ph.D. (Cornell University)
Professor, Botany

WARD, JOHN L., M.F.A. (University of New Mexico)
Professor, Art

WARD, RONALD W., Ph.D. (Iowa State University)
Professor, Food and Resource Economics

WARDOWSKI, WILFRED F., Ph.D. (Michigan State University)
Professor, Horticultural Science

WARNICK, ALVIN C., Ph.D. (University of Wisconsin)
Professor, Animal Science

WARNOCK, HAROLD P., Ph.D. (Cornell University)
Professor, Agricultural Education and Communication

WASS, HANNELORE L., Ph.D. (University of Michigan)
Professor, Foundations of Education

WATERS, WILLIE E., Ph.D. (University of Florida)
Professor, Horticultural Science

WATSON, DENNIS G., Ph.D. (Michigan State University)
Associate Professor, Agricultural Engineering

WATSON, JAMES K., Ph.D. (Rice University)
Professor, Electrical Engineering

WATSON, ROBERT T., M.D. (University of Florida)
Professor, Neuroscience

WATTENBARGER, JAMES L., Ed.D. (University of Florida)
Distinguished Service Professor, Educational Leadership

WATTLEWORTH, JOSEPH A., Ph.D. (Northwestern University)
Professor, Civil Engineering

WAYBRIGHT, DAVID A., D.M.A. (University of Cincinnati)
Professor, Music

WAYLEN, PETER R., Ph.D. (McMaster University)
Associate Professor, Geography

WEADE, REGINA, Ph.D. (Ohio State University)
Associate Professor, Instruction and Curriculum

WEBB, ALISTAIR I., Ph.D. (University of Bristol)
Professor, Veterinary Medicine

WEBB, DANIEL W., Ph.D. (Kansas State University)
Professor, Dairy Science

WEBB, RODMAN B., Ed.D. (Rutgers State University)
Professor, Foundations of Education

WEBB, ROGER S., Ph.D. (Virginia Polytechnic Institute)
Professor, Forest Resources and Conservation

WEBB, SAWNEY D., Ph.D. (University of California at Berkeley)
Professor, Zoology

WEBB, SUSAN E., Ph.D. (Cornell University)
Assistant Professor, Entomology and Nematology

WEBB, WILSE B., Ph.D. (State University of Iowa)
Graduate Research Professor, Psychology

WEEMS, HOWARD V., JR., Ph.D. (Ohio State University)
Professor, Entomology and Nematology

WEHLBURG, ALBERT, Ed.D. (University of Florida)
Professor, Theatre

WEHMEYER, ANN K., Ph.D. (University of Michigan)
Assistant Professor, Linguistics

WEI, CHENG-I, Ph.D. (University of California at Davis)
Professor, Food Science and Human Nutrition

WEIGOLD, MICHAEL F., Ph.D. (University of Florida)
Assistant Professor, Journalism and Communications

WEINGARTNER, DAVID P., Ph.D. (Michigan State University)
Associate Professor, Plant Pathology

WEISMANTEL, WILLIAM L., Ph.D. (Harvard University)
Professor, Urban and Regional Planning

WEISS, GERALD, Ph.D. (University of Michigan)
Professor, Anthropology

WEITZ, BARTON A., Ph.D. (Stanford University)
J. C. Penney Eminent Scholar, Marketing

WELCH, PAULA D., Ed.D. (University of North Carolina)
Professor, Exercise and Sport Sciences

WELDON, RICHARD N., Ph.D. (University of Minnesota)
Assistant Professor, Food and Resource Economics

WELTNER, WILLIAM, JR., Ph.D. (University of California at Berkeley)
Professor, Chemistry

WEST, CAROL T., Ph.D. (University of Michigan)
Professor, Economics

WEST, CHRISTOPHER M., Ph.D. (California Institute of Technology)
Associate Professor, Anatomy and Cell Biology

WEST, ROBIN L., Ph.D. (Vanderbilt University)
Associate Professor, Clinical and Health Psychology

WEST, ROGER L., Ph.D. (Texas A&M University)
Professor, Animal Science

WEST, SHERLIE H., Ph.D. (University of Illinois)
Professor, Agronomy

WESTERMANN-CLARK, GERALD B., Ph.D. (Carnegie-Mellon University)
Associate Professor, Chemical Engineering

WESTIN, ROBERT H., Ph.D. (Pennsylvania State University)
Professor, Art

WESTON, EDWARD G., Ph.D. (Florida State University)
Associate Professor, Journalism and Communications

WETHERINGTON, LEON ELLIS, Ph.D. (University of Florida)
Assistant Professor, Building Construction

WETHINGTON, JOHN A., JR., Ph.D. (Northwestern University)
Professor, Nuclear Engineering Sciences

WETTERQVIST, ORJAN F., M.S. (Royal Institute of Technology)
Associate Professor, Urban and Regional Planning

WHEATLY, MICHELE G., Ph.D. (University of Birmingham, England)
Associate Professor, Zoology

WHEATON, THOMAS A., Ph.D. (University of California at Berkeley)
Professor, Horticultural Science

WHEELER, RAYMOND M., Ph.D. (Utah State University)
Professor, Horticultural Science

WHEELER, TIMOTHY T., Ph.D. (University of Florida)
Assistant Professor, Oral Biology

WHEELER, WILLIS B., Ph.D. (Pennsylvania State University)
Professor, Food Science and Human Nutrition

WHIDDON, NANCY S., Ed.D. (Florida Atlantic University)
Professor, Exercise and Sport Sciences

WHITCOMB, WILLARD H., Ph.D. (Cornell University)
Professor, Entomology and Nematology

WHITE, ARTHUR O., Ed.D. (State University of New York at Buffalo)
Professor, Foundations of Education

WHITE, CALVIN E., Ph.D. (University of Arkansas)
Associate Professor, Animal Science

WHITE, JAMES M., Ph.D. (Ohio State University)
Associate Professor, Horticultural Science

WHITE, JOHN D., Ph.D. (University of Rochester)
Professor, Music

WHITE, KEITH D., Ph.D. (Brown University)
Associate Professor, Psychology

WHITE, MARJORIE A., Ph.D. (Case Western Reserve University)
Professor, Nursing

WHITE, NEIL L., Ph.D. (Harvard University)
Professor, Mathematics

WHITE, TIMOTHY L., Ph.D. (Oregon State University)
Associate Professor, Forest Resources and Conservation

WHITE, TONY, M.A. (Oklahoma State University)
Associate Professor, Architecture

WHITING, BERNARD, Ph.D. (Melbourne University)
Associate Professor, Physics

WHITNEY, E. DOW, Ph.D. (New York University)
Professor, Materials Science and Engineering

WHITNEY, JODIE D., Ph.D. (Oklahoma State University)
Professor, Agricultural Engineering

WHITTY, ELMO B., Ph.D. (North Carolina State University)
Professor, Agronomy

WILBURN, KENNETH, Ph.D. (Florida State University)
Assistant Professor, Educational Leadership

WILCOX, CHARLES J., Ph.D. (Rutgers State University)
Professor, Dairy Science

WILCOX, CHRISTOPHER S., Ph.D. (Oxford University)
Professor, Pharmacology and Therapeutics

WILCOX, MERRILL, Ph.D. (North Carolina State University)
Professor, Agronomy

WILDER, BUNA J., M.D. (Duke University)
Professor, Neuroscience

WILFRET, GARY J., Ph.D. (University of Hawaii)
Professor, Horticultural Science

WILKIE, ANN C., Ph.D. (University of Colorado)
Assistant Professor, Soil and Water Science

WILKINSON, EDWARD J., M.D. (Marquette University)
Professor, Pathology and Laboratory Medicine

WILLIAMS, CAROL A., Ph.D. (Yale University)
Associate Professor, Astronomy

WILLIAMS, CHARLES S., Ph.D. (University of Alabama)
Professor, Recreation, Parks, and Tourism

WILLIAMS, CLYDE M., Ph.D. (Oxford University)
Professor, Radiology

WILLIAMS, DAVID D., Ph.D. (University of Florida)
Professor, Nursing

WILLIAMS, DONALD E., Ph.D. (Northwestern University)
Professor, Communication Processes and Disorders

WILLIAMS, EMMETT L., Ph.D. (George Peabody College)
Professor, Instruction and Curriculum

WILLIAMS, JUDITH W.B., Ph.D. (University of Michigan)
Professor, Theatre

WILLIAMS, KIMBERLYN, Ph.D. (Stanford University)
Assistant Professor, Botany

WILLIAMS, MARY J., Ph.D. (Auburn University)
Assistant Professor, Agronomy

WILLIAMS, NORRIS H., Ph.D. (University of Miami)
Professor, Botany

WILLIAMS, PHILIP J., Ph.D. (University of Oxford)
Associate Professor, Political Science

WILLIAMS, RALPH C., M.D. (Cornell University)
Marcia Whitney Schott Professor in Rheumatoid Arthritis

WILLIAMS, ROBERT B., Ph.D. (Ohio State University)
Professor, Pharmacy Practice

WILLIAMS, SARA K., M.L.A. (Ohio State University)
Associate Professor, Landscape Architecture

WILLIAMS, WILLIAM N., Ph.D. (University of Florida)
Associate Professor, Oral Biology

WILLIAMSON, JEFFREY G., Ph.D. (Clemson University)
Associate Professor, Horticultural Science

WILLIS, STEVEN J., LL.M. (New York University)
Professor, Taxation

WILSON, DAVID C., Ph.D. (Rutgers State University)
Professor, Mathematics

WILSON, HAROLD A., Ph.D. (University of Iowa)
Associate Professor, History

WILSON, HENRY R., Ph.D. (University of Maryland)
Professor, Poultry Science

WILSON, JOSEPH N., Ph.D. (University of Virginia)
Assistant Professor, Computer and Information Sciences

WILSON, MARGARET E., Ph.D. (University of Florida)
Associate Professor, Nursing

WILSON, ROBERT E., Ph.D. (University of Pennsylvania)
Professor, Astronomy

WILSON, WILLIAM W., IV, M.F.A. (Chicago Art Institute)
Professor, Art

WINARSKY, IRA H., M.F.A. (Temple University)
Professor, Architecture

WINEFORDNER, JAMES D., Ph.D. (University of Illinois)
Graduate Research Professor, Chemistry

WING, ELIZABETH S., Ph.D. (University of Florida)
Professor, Anthropology

WINGO, CHARLES S., M.D. (Louisiana State University)
Professor, Physiology

WINTER, WILLIAM E., M.D. (University of Chicago)
Associate Professor, Pathology and Laboratory Medicine

WISEMAN, BILLY R., Ph.D. (Kansas State University)
Professor, Entomology and Nematology

WITTE, RONALD, M.Arch. (Princeton University)
Assistant Professor, Architecture

WITTMER, PAUL J., Ph.D. (Indiana State University)
Distinguished Service Professor, Counselor Education

WOESTE, JOHN T., Ph.D. (University of Wisconsin)
Professor, Agricultural Education and Communication

WOFFORD, DAVID S., Ph.D. (New Mexico State University)
Associate Professor, Agronomy

WOJCIK, DANIEL P., Ph.D. (University of Florida)
Assistant Professor, Entomology and Nematology

WOLFF, RONALD G., Ph.D. (University of California at Berkeley)
Associate Professor, Zoology

WOLKING, WILLIAM D., Ph.D. (University of Minnesota)
Professor, Special Education

WOOD, CHARLES E., Ph.D. (University of California at San Francisco)
Professor, Physiology

WOOD, FRANK B., Ph.D. (Princeton University)
Professor, Astronomy

WOOD, JANICE A., Ph.D. (Florida State University)
Associate Professor, Instruction and Curriculum

WOOD, R. CRAIG, Ed.D. (Virginia Polytechnic Institute)
Professor, Educational Leadership

WOODARD, JAMES C., Ph.D. (Massachusetts Institute of Technology) **and D.V.M.** (Auburn University)
Professor, Pathology and Laboratory Medicine and Veterinary Medicine

WOODARD, RICHARD P., Ph.D. (Harvard University)
Assistant Professor, Physics

WOODRUFF, ROBERT E., Ph.D. (University of Florida)
Professor, Entomology and Nematology

WOODRUFF, WILLIAM, Ph.D. (University of Nottingham)
Graduate Research Professor, History

WOODS, CHARLES A., Ph.D. (University of Massachusetts)
Professor, Zoology

WRIGHT, DAVID L., Ph.D. (Virginia Polytechnic Institute)
Professor, Agronomy

WRIGHT, JOHN W., Ph.D. (Ohio State University)
Professor, Journalism and Communications

WRIGHT, ROBERT G., Ph.D. (University of Kansas)
Associate Professor, Instruction and Curriculum

WRONSKI, THOMAS J., Ph.D. (University of Utah)
Associate Professor, Veterinary Medicine

WUTSCHER, HEINZ K., Ph.D. (Cornell University)
Professor, Horticultural Science

WYATT-BROWN, ANNE M., Ph.D. (Case Western Reserve University)
Assistant Professor, Linguistics

WYATT-BROWN, BERTRAM, Ph.D. (Johns Hopkins University)
Richard J. Milbauer Professor of History

XU, CHUAN-YI, Ph.D. (Massachusetts Institute of Technology)
Assistant Professor, Mathematics

YAMAMOTO, JANET K., Ph.D. (University of Texas)
Associate Professor, Veterinary Medicine

YANG, MARK C., Ph.D. (University of Wisconsin)
Professor, Statistics

YANG, THOMAS P., Ph.D. (University of California at Irvine)
Assistant Professor, Biochemistry and Molecular Biology

YARANDI, HOSSEIN N., Ph.D. (Indiana University)
Associate Professor, Nursing

YAU, STEPHEN S., Ph.D. (University of Illinois)
Professor, Computer and Information Sciences

YEAGER, THOMAS H., Ph.D. (Virginia Polytechnic Institute)
Professor, Horticultural Science

YEE, GARY C., Pharm.D. (Philadelphia College of Pharmacy)
Associate Professor, Pharmacy

YELENOSKY, GEORGE, Ph.D. (Duke University)
Professor, Horticultural Science

YELTON, JOHN M., Ph.D. (Oxford University)
Associate Professor, Physics

YERALAN, SENCER, Ph.D. (University of Florida)
Associate Professor, Industrial and Systems Engineering

YII, ROLAND, Ph.D. (University of Pennsylvania)
Scientist, Electrical Engineering

YIN, GEORGE K., J.D. (George Washington University)
Associate Professor, Taxation

YOST, JEFFREY A., Ph.D. (Ohio State University)
Assistant Professor, Accounting

YOST, RICHARD A., Ph.D. (Michigan State University)
Professor, Chemistry

YOUNG, DAVID C., Ph.D. (University of Iowa)
Professor, Classics

YOUNG, DAVID G., Ph.D. (University of Florida)
Associate Scientist, Entomology and Nematology

YOUNG, DAVID M., M.D. (Duke University)
Professor, Biochemistry and Molecular Biology

YOUNG, JERALD W., Ph.D. (Yale University)
Associate Professor, Managment

YOUNG, MARTIN D., Sc.D. (Johns Hopkins University)
Professor, Immunology and Medical Microbiology and Veterinary Medicine

YOUNG, VANEICA Y., Ph.D. (University of Missouri)
Associate Professor, Chemistry

YU, SIMON S., Ph.D. (McGill University)
Professor, Entomology and Nematology

ZABEL, EDWARD, Ph.D. (Princeton University)
Professor, Economics

ZAM, STEPHEN G., Ph.D. (University of Southern California)
Associate Professor, Microbiology and Cell Science

ZAPPE, CHRISTOPHER J., Ph.D. (Indiana University)
Assistant Professor, Decision and Information Systems

ZAZUETA, FEDRO S., Ph.D. (Colorado State University)
Professor, Agricultural Engineering

ZEMAN, JOSEPH J., Ph.D. (University of Chicago)
Professor, Philosophy

ZENGEL, JANET E., Ph.D. (University of Miami)
Associate Professor, Neuroscience

ZERNER, MICHAEL C., Ph.D. (Harvard University)
Professor, Chemistry

ZETTLER, FRANCIS W., Ph.D. (Cornell University)
Professor, Plant Pathology

ZIEGER, ROBERT H., Ph.D. (University of Maryland)
Professor, History

ZIEGERT, JOHN C., Ph.D. (University of Rhode Island)
Assistant Professor, Mechanical Engineering

ZILLER, ROBERT C., Ph.D. (University of Michigan)
Professor, Psychology

ZIMET, DAVID J., Ph.D. (University of Florida)
Associate Professor, Food and Resource Economics

ZIMMERMAN, DAVID C., Ph.D. (State University of New York at Buffalo)
Associate Professor, Aerospace Engineering, Mechanics, and Engineering Science

ZIMPFER, WALTER H., M.S. (Rutgers State University)
Associate Professor, Civil Engineering

ZIPFEL, PETER H., Ph.D. (Catholic University of America)
Associate Professor, Aerospace Engineering, Mechanics, and Engineering Science

ZOLTEK, JOHN, JR., Ph.D. (California Insitute of Technology)
Professor, Environmental Engineering Sciences

ZOLTEWICZ, JOHN A., Ph.D. (Princeton University)
Professor, Chemistry

ZORY, PETER S., JR., Ph.D. (Carnegie-Mellon University)
Professor, Electrical Engineering

ZSEMBIK, BARBARA A., Ph.D. (University of Texas at Austin)
Assistant Professor, Sociology

ZUCALI, JAMES R., Ph.D. (University of Florida)
Assistant Scientist, Urban and Regional Planning

ZWICK, PAUL D., Ph.D. (University of Florida)
Associate Scientist, Urban and Regional Planning

INDEX

A

Abbreviations of Names of Degrees, 5
Academic Spoken English, B, 51, 127
Accounting, Research & Professional Education, Center for, 46
Administration, Officers of, iv
Admission: Application for, 7; to Candidacy, 24; see Specific Degrees; Conditional, 9; of Faculty, 9; of Foreign Students, 8; General Requirements for, 8; Postbaccalaureate, 9
Admission, Examinations, 8
Advanced Study of the Communication Processes, Institute for, 45
Aeronomy & Other Atmospheric Sciences, Center for (ICAAS), 46
Aerospace Engineering, Mechanics, & Engineering Science, 57
African Studies: Center for, 40, 59; Certificate in, 40
Agency, Correctional, & Developmental Counseling, 88
Agricultural Education & Communication, 59
Agricultural Engineering, 60
Agricultural Experiment Station, Florida, 44
Agricultural Management & Resource Development, 15, 105
Agricultural Research & Extension Centers, 45
Agriculture–General, 62
Agroforestry, 42
Agronomy, 62
Anatomy & Cell Biology, 63
Animal Science, 64; General, 64
Anthropology, 65
Apartment Villages, 29
Applied Linguistics, 128
Applied Mathematics, Center for, 46
Aquatic Plants, Center for, 46
Architecture, 67; M.Arch., 15; M.S.A.S., 19
Art, 69
Art Education, 69
Art History, 69
Assistantships & Fellowships, 31; Application, 31; see *also* Specific Departments
Astronomy, 70
Awarding of Degrees, 12
Awards: see Financial Aid, 31; see *also* Specific Departments

B

Biochemistry & Molecular Biology, 72
Biological Sciences, 42
Board of Regents, iv; Summer Program for African-American Graduate Students, 31
Botany, 73
Brechner Center for Freedom of Information, 46
Buckley Amendment, 10
Building Construction, 74; M.B.C., 15; M.S.B.C., 13
Bureau of Economic & Business Research, 47
Business Administration, 75; General Courses in, 75; GMAT, 8; MBA, 15
Business Ethics Education & Research, Center for, 47

C

Candidacy, Admission to, 24; see *also* Specific Degrees
Career Resource Center, 51
Catalog of Graduate & Postdoctoral Support, 34
Cell Biology, Anatomy &, 63
Certificate in African Studies, 40; Chemical Physics, 43; Gerontology, 43; Latin American Studies, 40; Manufacturing Systems Engineering, 17; Political Campaigning, 158; Public Administration, 158; Teaching English as a Second Language, 126; Tropical Agriculture, 41; Wetlands, 50; Women in Development, 42; Women's Studies, 44, 176
Certification of Degree Requirements, 25
Change of College or Major Department, 11
Chemical Engineering, 76
Chemical Physics, Center for, 43; Certificate in, 43
Chemistry, 77
Civil Engineering, 79; M.C.E., 17
Classics, 81
Classification, Florida & Non-Florida, 25
Clinical & Health Psychology, 82
Clinical Chemistry, 149
Clinical Research Center, 47
Coastal & Oceanographic Engineering, 83
Colleges & Areas of Instruction (Indexed by College), 54
Commencement, Attendance & Attire, 12
Communication Processes, Institute for Advanced Study of the, 45
Communication Processes & Disorders, 84
Communication Research Center, 47
Communicative Disorders, 86
Comprehensive Examinations, 14, 24
Computational Facilities, 35
Computer & Information Sciences, 86
Concentrated Study, Period of, 24
Concurrent Graduate Programs, 11
Conditional Admission, 9
Confidentiality of Student Records, 10
Consumer Research, Center for, 47
Cooperative Degree Programs, 9
Cooperative Living Arrangements, 30
Correspondence Work, 10
Counseling Center, 52
Counseling Psychology, 160
Counselor Education, 88
County Agents, Admission of, 9
Courses: Levels Defined, 10; Requirements, 11
Credit: Definition of Hours, 10; Minimum, 10; Residence Requirements, 24; Transfer of, 13
Curriculum & Instructional Leadership, 93

D

Dairy Science, 90
Deadline Dates, vi
Decision & Information Sciences, 90
Deferred Grade H, 11
Degrees: Awarding of, 12; Commencement, 12; Doctoral, 22; Ed.S., 21; Engr., 20; Final Semester, 12; General Regulations Concerning Master's, 12; Requirements for, see Specific Degrees; Time Limits on, 13, 21, 22, 25
Dietetics, 106
Disabilities, Students with, 6
Dissertations, 24; Guidelines of Restriction of Release, 24
Doctoral Degrees, 7; Ed.D., 21; Ph.D., 22; see Specific Departments
Dynamic Plasticity, Center for, 47

E

Early Childhood Education, 123
Economic & Business Research, Bureau of, 47
Economics, 91
Economics & Business Studies, Center for International, 48
Editorial Assistance & Information, Graduate School, 51
Education: Awards for Graduate Students in, 32; Degrees in (M.A.E., 13; M.Ed., 17; Ed.S., 21; Ed.D., 22; Ph.D., 22); Research Preparation Requirement for Programs in, 22; see Specific Departments
Education of the Emotionally Disturbed, 168
Education of the Mentally Retarded, 168
Educational Administration, 93
Educational Leadership, 93
Educational Media & Instructional Design, 123
Educational Psychology, 109
Electrical Engineering, 95
Elementary Education, 123
Engineer Degree, Requirements for, 20; see *also* Specific Departments
Engineering: Awards for Graduate Students in, 32; Degrees in (M.E., 17; M.S., 13; Engr., 20; Ph.D., 22); & Industrial Experiment Station (EIES), 45; State Center, 36
Engineering Science & Mechanics, 57
English, 98
English Education, 123
English Language Institute, 51
English Skills for International Students, 51
English, Test of Spoken, 8
Entomology & Nematology, 98
Environmental Engineering Sciences, 100
Environmental Horticulture, 118
Examinations: for Degrees (Master's, 13; Engr., 21; Ed.S., 21; Ed.D., 22, 25; Ph.D., 24, 25); of Educational Testing Service (GMAT, 8; GRE, 8; TOEFL, 8; TSE, 8); Foreign Language Requirement, 11, 23; see *also* Specific Departments

Exercise & Sport Sciences, 102; M.E.S.S., 20; M.S.E.S.S., 20
Exercise Science, Center for, 47
Expenses, 27
Experiment Stations: Agricultural, 44; Engineering, 45

F

Faculty, Graduate, 178; see Specific Departments; Registration of as Students, 9
Family Student Housing, 30
Fees: Application, 27; Audit, 27; GRE, 27; Health, 27; Late Registration, 27; Library Binding, 28; Microfilm, 28; Refund of, 29; Registration & Instructional, 27; Special, 27; Tuition, 27; see *also* Past Due Student Accounts, 29
Fellowships & Assistantships, 31
Fields of Instruction, 54
Final Examination, 12; see *also* Specific Degrees
Final Semester, Procedure for, 12
Finance, Insurance, & Real Estate, 103
Financial Aid, 31
Financial Institutions Center, 47
Fine Arts, M.F.A., 17; M.M., 19
Florida Agricultural Experiment Station, 44
Florida Architecture & Building Research Council, 48
Florida Engineering & Industrial Experiment Station, 45
Florida Engineering Education Delivery System (FEEDS), 36
Florida Insurance Research Center, 48
Florida Students, Classification of, 25
Food & Resource Economics, 105
Food Science & Human Nutrition, 106
Foreign Language Education, 123
Foreign Language Examinations, 11, 23; Fees for, 27; Requirements for, 11, 23; see *also* Specific Departments
Foreign Students: Admission of, 8; Adviser to, 52; English Language Institute, 51; GRE, 8; Resident Alien, 25; TOEFL, 8; TSE, 8
Forest Resources & Conservation, 108; M.F.R.C., 18
Foundations of Education, 109
Freedom of Information, Brechner Center for, 46
French, 164
Fulbright-Hays Fellowships, 33

G

Galleries, Art, 35
General Regulations, 9
Geography, 111
Geology, 112
Germanic & Slavic Languages & Literatures, 113
Gerontological Studies, Center for, 114; Certificate in, 43
Grades: for Admission, 8; for Admission to Candidacy, 24; Conditional Admission, 9; Deferred, 11; Incomplete, 11;Unsatisfactory Scholarship, 11
Graduate & Postdoctoral Support, Catalog of, 34
Graduate Council: Duties, 5; Members, v
Graduate Degrees & Programs, 5
Graduate Management Admission Test (GMAT), 8
Graduate Minority Fellowships, 31
Graduate Record Examination (GRE), 8; Fees, 27; Foreign Students, 8; Postponement of, 8
Graduate School: Administration, v; Faculty, 178; General Regulations of, 9; Organization & History, 5
Graduate Student Handbook, 52

H

Harris Fellowships, 31
Health & Hospital Administration, 115; M.H.S./M.B.A., 16
Health & Human Performance: M.E.S.S., 20; M.H.S.E., 18; M.S.E.S.S., 20; M.S.H.S.E., 13; M.S.R.S., 13
Health Physics, 43
Health Policy Research, Center for, 48
Health Related Professions–General, 114
Health Science Education, 114; M.H.S.E., 18; M.S.H.S.E., 13
Health Service, Student, 52
Health Services Administratinn, 115
Hearing Clinic, Speech &, 52
Higher Education, 94
Higher Education, Institute for, 48
History, 116
Horticultural Science, 118
Housing: Application for, 29; Family, 30; Off-Campus, 30; On-Campus, 30
Human Nutrition, Food Science &, 106
Human Resources Research Center, 48
Hydrologic Sciences, 43

I

Immunology & Medical Microbiology, 120
Immunology & Molecular Pathology, 149
Incomplete Grades, 11
Industrial & Systems Engineering, 120
Infirmary, 52
In-State Fee Waivers, 31
Institutional Purpose, 3
Instruction & Curriculum, 122
Interdisciplinary Graduate Studies, 39
Interdisciplinary Research Centers, 46
International Economics & Business Studies, Center for, 48
International Relations, 40, 158
International Student Services, Office for, 52
International Studies, 39

J

Joint Degree Programs: J.D./M.A. (Public Administration), 158; J.D./M.A.M.C., 131; J.D./M.A.U.R.P., 15; J.D./M.B.A., 16; J.D./M.Acc., 14; J.D./Ph.D. (History), 116; M.B.A./M.H.S., 16; M.B.A./Pharm.D., 16; M.B.A./M.I.B., 16; M.B.A./B.S.I.S.E., 16
Journalism & Communications, 131; Communication Research Center, 47; M.A.M.C., 13
Junior College Teaching, Degrees for, 14; see *also* Specific Departments

L

Landscape Architecture, 125; M.L.A., 19
Language Examinations: Doctoral, 11; Master's, 23; Requirements for, see Specific Departments
Latin, 81
Latin American Studies, Center for, 40, 126; Certificates in, 40
Law: Joint Programs, J.D./M.A., 15; J.D./M.A.U.R.P., 15; J.D./M.Acc., 14; J.D./M.B.A., 16; J.D./M.A.M.C., 131; J.D./Ph.D., 116
Law (Taxation), 171; Awards for Graduate Students in, 33; LL.M. in Tax., 19
Leave of Absence, Ph.D., 23
Liberal Arts & Sciences, Degrees in: M.A., 13; M.A.T., 14; M.S., 13; M.S.T., 14; M.Stat., 20; Ph.D., 22; Internship in College Teaching, 14
Libraries, University, 36
Linguistics, 126; Core, 127; Applied, 127; Service Courses, 128
Loans, 34; see *also* Financial Aid, 31

M

Macromolecular Science, Center for, 48
Major Analytical Instrumentation Center (MAIC), 38
Majors: for Master's, 5; for Ed.S., 6; for Engr., 6; for Ed.D., 7; for Ph.D., 7; see *also* Specific Departments
Management, 128
Manufacturing Systems Engineering, Certificate in, 17
Marine Laboratories, 42
Marketing, 129
Mass Communication, 131
Master's Degrees, 5; General Regulations Concerning, 12; Requirements for, 12; Specific: LL.M. in Tax., 19; M.A., 13; M.Acc., 14; M.A.E., 13; M.Ag., 14; M.A.M.C., 13; M.A.M.R.D., 15; M.Arch., 15; M.A.T., 14; M.A.U.R.P., 15; M.B.A., 15; M.B.C., 15; M.E., 17; M.Ed., 17; M.E.S.S., 20; M.F.A., 17; M.F.R.C., 18; M.H.S., 18; M.H.S.E., 13; M.L.A., 19; M.M., 19; M.Nsg., 20; M.S., 13; M.Stat., 20; M.S.A.S., 19; M.S.B.C., 13; M.S.E.S.S., 20; M.S.H.S.E., 20; M.S.Nsg., 20; M.S.P., 13; M.S.R.S., 13; M.S.Stat., 13; M.S.T.,14
Materials Science & Engineering, 133
Mathematical System Theory, Center for, 49
Mathematics, 134

Mathematics Education, 124
McKnight Black Doctoral Fellowships, 32
Mechanical Engineering, 137
Medical Physics, 43
Medical Sciences, Awards for Graduate Students in, 33; General Courses, 138; see also Specific Departments
Medicinal Chemistry, 139
Microbiology & Cell Science, 140
Microbiology, Immunology & Medical, 120
Microfilming Dissertation, 24; Fee for, 28
Middle School Education, 124
Mineral Resources Research Center, 49
Minimum Registration, 10
Minors: for Master's see Specific Departments; for Ed.D., 22; for Ph.D., 23
Mission and Goals, UF, 3
Molecular Biology, Biochemistry &, 72
Monograph Series, Humanities & Social Sciences, 38
Museum of Natural History, Florida, 38
Music, 141
Music Education, 141

N

NDEA Fellowships, Title VI, 34; Fulbright-Hays, 33
Neurobiological Sciences, Center for, 49
Neuroscience, 143
Nexus Tapes, 34
Non-Florida Students, Classification of, 25; Tuition Waivers, 31
Nonthesis Degrees, 5; Thesis Option, 5
Nonthesis Option, 6
Nuclear Engineering Sciences, 143
Nursing, 145; Awards for Graduate Students in, 33; M.Nsg., 20; M.S.Nsg., 20
Nutritional Sciences, 106; Center for, 49

O

Oak Ridge Associated Universities (ORAU), Research Program at, 39
Occupational Therapy, 147; M.H.S., 18
Off-Campus: Credits, 10; Housing, 30
Oral Biology, 147
Organization for Tropical Studies, 41
Overseas Studies, Office for, 52

P

Parking Administrative Services, 29
Past Due Accounts, 29
Pathology & Laboratory Medicine, 148
Pharmaceutical Sciences–General, 149
Pharmaceutics, 150
Pharmacodynamics, 150
Pharmacology & Therapeutics, 151
Pharmacy: Awards for Graduate Students in, 33; M.S.P., 13
Pharmacy Health Care Administration, 151
Philosophy, 152
Physical Therapy, 153; M.H.S., 18
Physics, 153
Physiology, 155
Plant Molecular & Cellular Biology, 156
Plant Pathology, 156
Political Campaigning, Certificate in, 158
Political Science, 157
Portuguese, 165
Postbaccalaureate Students: Admission of, 9; Transfer of Credit, 9
Poultry Science, 159
Press, University of Florida, 39
Psychology, 159; Awards for Graduate Students in, 34
Public Administration, 158
Public Policy Research Center, 49
Public Utility Research Center, 49

Q

Qualifying Examination: for Ed.D., 22; for Ph.D., 24
Quantum Theory Project, 44

R

Reading Education, 124
Real Estate, 103
Real Estate Research Center, 50
Reexamination: for Ed.D., 22; for Ph.D., 24
Recreation, Parks, & Tourism, 162; M.S.R.S., 13
Refund of Fees, 29
Registration: Fees for, 27; for Final Semester, 12; Denial of, 11; Late, 29; Minimum Hours, 10, 12, 31; of Undergraduates in Graduate Courses, 11
Regulations, General, 9
Rehabilitation Counseling, 162; M.H.S., 19
Religion, 163
Research & Evaluation Methodology, 109
Research & Teaching Facilities, 35
Research Organizations, 44
Residence Halls, for Single Students, 29
Residence Requirements: for Master's, 12; for Ed.S., 22; for Engr., 20; for Doctorate (Concentrated Period of Study), 24
Residents, Florida & Non-Florida, 25
Resource Center, Career, 51
Retail Education & Research, Center for, 50
Romance Languages & Literatures, 164
Russian, 114

S

Scholarships, 31
School Counseling & Guidance, 88
School Psychology, 109
Science Education, 124
Seahorse Key, Marine Laboratory at, 42
Sea Turtle Research, Center for, 42
Secondary Education, 125
Service Courses for International Students,128
Smathers Libraries, 36
Social Studies Education,125
Sociology, 165
Soil & Water Science, 167
Spanish, 165
Special Education, 168
Special Facilities & Programs, 35
Specialist in Education Degree, 21
Specific Learning Disabilities, 168
Speech, 84
Speech & Hearing Clinic, 52
Speech Pathology, 84, 168
Sponsored Research, Division of, 45
State Employees' Free Enrollment, 28
State University System Programs, 9
Statistics, 169; M.Stat., 20; M.S.Stat., 13
Student: Conduct, 10; Responsibility of, 9; Services for, 51
Student Aid, 31
Student Personnel in Higher Education, 88
Studies of Advanced Structural Composites, Center for, 50
Study Loads, 10
Supervisory Committee: Master's, 12; Engr., 21; Ed.S., 21; Ed.D., 23; Ph.D., 23

T

Taxation, 171; LL.M. in Tax., 19
Theatre, 172; M.F.A., 17
Thesis, 13; Editorial Services, 51; Final Examination, 12; Option, 5
Thesis Degrees, 6; see Specific Degrees; Nonthesis Option, 6
Time Lapse: Between Final Examination & Graduation, 14, 24; Between Qualifying Examination & Graduation, 24
Time Limits on Degrees, 13, 21, 25
Title VI–Foreign Language & Area Studies Fellowships, 34
TOEFL–Test of English as a Foreign Language, 8
Toxicology, 44

Traineeships: in Psychology, 34; Minimum Registration for, 31
Transfer of Credit: for Master's, 12; for Ed.S., 22
Traveling Scholar Program, 9
Tropical Agriculture, Center for, 41
Tropical Studies, Organization for (OTS), 41
Tuition: Fees, 27; Loans, 34; Scholarships (Financial Aid), 31

U

Undergraduate: Record, 8; Registration in Graduate Courses, 11; Requirements for Graduate Courses, see Specific Departments
University of Florida, 3
University-Wide Awards, 31
Unsatisfactory Scholarship, 11
Urban & Regional Planning, 173; M.A.U.R.P., 15; Urban & Regional Planning/Law, 15

V

Veterans, Information for, 11
Veterinary Medical Sciences, 174
Vocational, Technical, & Adult Education, 94

W

Wetlands & Water Resources, Center for, 50
Whitney Marine Laboratory, 42
Women in Development, Certificate in, 42
Women's Studies, 176; Certificate in, 44

Z

Zoology, 176

SUMMARY OF PROCEDURES FOR MASTER'S, ENGINEER, AND SPECIALIST IN EDUCATION DEGREES

(It is the *student's* responsibility to ascertain that all requirements have been met and that every deadline is observed.)

PROCEDURE	RESPONSIBLE PARTY	ACTION DATE
Formation of supervisory committee and submission of Supervisory Committee form	Graduate Coordinator or Supervisory Committee Chairperson	Not later than the second term.
Transfer of credit	Graduate Coordinator or Supervisory Committee Chairperson	*First* term enrolled in Graduate School.
Change in supervisory committee	Supervisory Committee Chairperson	As soon as change occurs.
Submission of revised Supervisory Committee form	Department Chairperson	As soon as supervisory committee chairperson reports change.
Petition (if needed) regarding graduation	Supervisory Committee Chairperson	4:00 PM last day of classes in the term *preceding* the one in which the degree is to be awarded.
Pick up a copy of *Deadline Dates* and have record checked at Student Records Office, 288 Grinter Hall	Student	Term prior to one in which degree will be awarded.
Final term registration	Student	3-credit minimum [see *Deadline Dates* for exception].
Placement of name on graduation list [application for diploma, placement of name in commencement program, and placement of name on list to receive information on commencement procedures]	Student	*Prior* to published deadline.* Make application at Registrar's Office or Graduate School. Opportunity to apply is provided in registration procedure.
Removal of incompletes	Student/Instructor	Photocopy of grade change slip with all signatures on it must be *in* Graduate School not later than 4:00 PM last day of classes.
Final comprehensive examination	Supervisory Committee	No sooner than the term prior to the one in which degree is to be awarded. *Original only* of Examination Report is sent to Graduate Student Records, 288 Grinter Hall.

ADDITIONAL REQUIREMENTS FOR THESIS OPTION

Pick up copy of *Guide for Preparing Theses and Dissertations* (168 Grinter Hall)	Student	*Before* first draft of thesis is typed. Read guidelines carefully and supply a copy to the typist. Student is expected to have the thesis in proper form before giving it to the typist.
Submission of Announcement of Examination form	Chairperson, Supervisory Committee	Form must be *in* Graduate School not later than 10 working days *prior* to the scheduled examination.
Final examination	Supervisory Committee	Not more than 6 months prior to the date the degree will be awarded. *Original only* of Final Examination Report should be turned into the Graduate School Editorial Office (168 Grinter Hall) with the final copy of the thesis.
Payment of binding fee [also microfilming fee if in nursing] (S113 Criser)	Student	Prior to submission of thesis to Graduate School; turn in receipt with thesis.
First submission of thesis (168 Grinter Hall)	Student	Specified deadline.* Turn in *original* copy of thesis to Graduate School for review.
Submission of original and college copies of corrected thesis	Student	Specified deadline.* Make corrections and copy of thesis on 100%, 20 lb. rag and deliver to appropriate office.

*_Deadline Dates_ is published every term and is readily available in the Graduate School and college and department offices.

SUMMARY OF PROCEDURES FOR DOCTORAL DEGREES

(It is the *student's* responsibility to ascertain that all requirements have been met and that every deadline is observed.)

PROCEDURE	RESPONSIBLE PARTY	ACTION DATE
Formation of supervisory committee and submission of Supervisory Committee form	Supervisory Committee Chairperson	Not later than the second term of doctoral program.
Transfer of credit	Supervisory Committee Chairperson	Request must be submitted to the Graduate School during the term in which the supervisory committee is appointed.
Change in supervisory committee	Supervisory Committee Chairperson	As soon as change occurs.
Submission of revised Supervisory Committee form	Department Chairperson	As soon as supervisory committee chairperson reports change.
Qualifying examination	Supervisory Committee/Department	Not sooner than the 4th semester of graduate study beyond the bachelor's degree; not later than midpoint of term if that term is to count toward time lapse before graduation.
Admission to candidacy	Supervisory Committee	Admission to Candidacy form should be submitted to the Graduate School *immediately* upon satisfactory completion of the entire qualifying examination.
Pick up copy of *Guidelines for Preparing Theses and Dissertations* (168 Grinter Hall)	Student	Before first draft of dissertation is typed. Read guidelines carefully and supply a copy to typist. The dissertation is expected to be in proper form before it is given to the typist.
Registration in doctoral research (7980)	Student/Supervisory Committee Chairperson	*After* the qualifying examination has been passed and student is admitted to candidacy.
Obtain copy of *Deadline Dates* and check record at Graduate Student Records Office, 288 Grinter Hall.	Student	Term *prior* to graduation.
Petition (if needed) regarding graduation	Supervisory Committee Chairperson	4:00 PM last day of classes in the term *preceding* the one in which the degree is awarded.
Placement of name on graduation list [application for diploma, placement of name in commencement program, and placement of name on list to receive information on commencement procedures]	Student	*Prior* to published deadline.* Make application at Registrar's Office or Graduate School. Opportunity to apply is provided in registration procedure.
Submission of Announcement of Examination form and Abstract	Supervisory Committee Chairperson	Form and abstract must be *in* Graduate School not later than 10 working days *prior* to scheduled examination.
First submission of dissertation and related forms and receipts	Student	Submit to Editorial Office (168 Grinter) no later than 5 working days prior to scheduled examination and no later than 4:00 PM of the specified deadline.*
Removal of incompletes	Student/Instructor	Photocopy of grade change slip with all signatures on it must be *in* Graduate School not later than 4:00 PM last day of classes of term of graduation.
Final Examination	Supervisory Committee	Not more than 6 months prior to the date the degree will be awarded. *Original only* of Final Examination Report should be turned into the Graduate School Editorial Office (168 Grinter Hall) with the final copy of the dissertation.
Final submission of original and college copies of the dissertation	Student	No later than 4:00 PM of the specified deadline. Submit to the Editorial Office the corrected original. Consult the Editorial Office or department chair for instruction on where to submit the library (college) copy of the dissertation.

**Deadline Dates* is published every term and is readily available in the Graduate School and college and department offices.

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